The World's Favourite Flight Simulation Magazine - www.pcpilot.net

PC PILOT

FREE AIRCRAFT WITH THIS ISSUE

FREE CD WITH THIS ISSUE

Includes aircraft, upgrades, shareware and lots, lots more

EUROVISION COMBAT CONTEST

Eurofighter Typhoon gets the star treatment

REAL TO SIMULATED

Transatlantic – virtual and actual

IS 2002 A MAGIC NUMBER?

Microsoft's plans for their new sim – from the horse's mouth

UNDER CONSTRUCTION

Features on how flight sims work, scenery design and editing

"CLIMB AND MAINTAIN 12,000 MSL"

Pushing tin with ATC Simulator

PLUS ALL THIS INSIDE:

Flight Deck II • Korean Combat Pilot • Harrier Jump Jet • Graphics Cards • Processors • Tutorial • Videos • Books • Flight Modelling • and more...

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THE X-PLANE GUIDE TO: AERO DYNAMICS

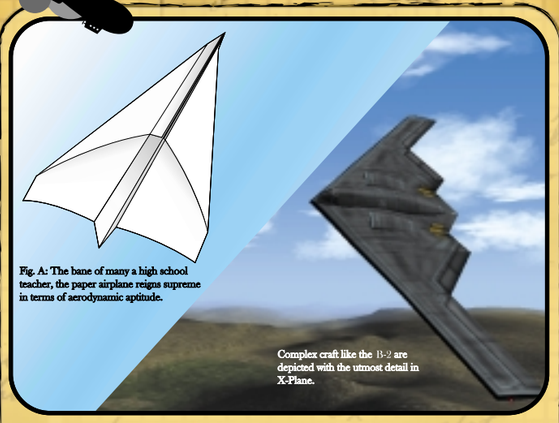
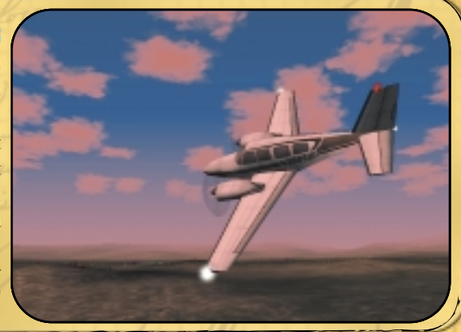


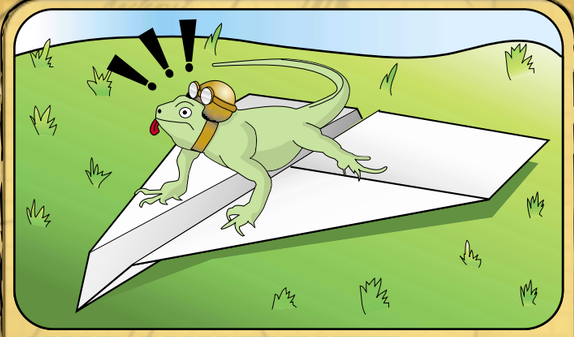
Fig. A: The bane of many a high school teacher, the paper airplane reigns supreme in terms of aerodynamic aptitude.

Complex craft like the B-2 are depicted with the utmost detail in X-Plane.

SIMPLE AERODYNAMICS are best explained through the use of such classic objects as the paper airplane (fig. A). Even in today's high tech flight sim market, only X-Plane can accurately depict this marvel of physics.

X-PLANE'S flawless aerodynamics model is the perfect constant to test the theory, "Can I launch a paper airplane 500 ft. from my office window."





ONCE CONSTRUCTED, you must outfit your test craft with a pilot. While plastic army men are more suited to an aerial environment, a small garden lizard can be an excellent test pilot for your maiden voyage.

Plane Maker Utility

PROPER FLIGHT procedure requires preflight training, and X-Plane offers just the tools you'll need. Simply recreate your paper masterpiece using X-Plane's exclusive Plane Maker and test it out using actual scenery with real-time weather updates.

NEXT LESSON: How to manipulate the aerodynamic structure of your other flight sim CD's. X-Plane. The most advanced PC flight sim ever.

NOTE THAT WHILE sophisticated in it's own right, the lizard's natural interface is far surpassed by that of X-Plane, which sports ultra-realistic navigation and instrumentation.

Laminar Research

X-PLANE

VISIT WWW.XICAT.COM FOR PLAYABLE DEMO!

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PC PILOT

THE CREW

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A vote of confidence

Welcome to another great issue of PC Pilot. Following the launch of Issue 10 into UK newsagents, we've now got the largest circulation of any flight simulation magazine and it's all thanks to our loyal and devoted readers. We're really grateful for all your feedback that's helped us to put PC Pilot on top. Keep it coming and remember - it's your magazine.

In this issue we've put together some great features that will hopefully answer your many questions about how flight sims actually work. Whether you're a full time developer, or just someone who's wondered "how do they do that?" we hope the features on writing a flight sim, scenery design and flight modelling will shed a little more light on our fascinating hobby.

Meanwhile, back down on the ground, Britain is gripped by election fever. By the time you read this there will probably be a new government. Whilst our forbears fought to preserve democracy (see Combat Flight Simulator etc. for more details) it seems that nowadays one of the biggest tasks facing the parties will be getting people out to vote. In an effort to help shake the country out of its apathy, we conducted our own opinion poll on flight sim related matters. The results were astonishing:

1. **Do you think the new version of Flight Simulator should be better than the old one?**
   Yes – 96%
   No – 4% (otherwise, what would I have to moan about)

2. **Would you prefer to pay for your next flight sim in Euros or Pounds?**
   Euros – 45%
   Pounds – 49%
   (please note that 6% of the vote was taken in commission when converting to local currency)

3. **What is it you most enjoy about flight simulation?**
   Flying – 66%
   Tinkering with my sim – 30%
   Writing messages in forums – 4% (see question 1.)

We'll be passing our findings to all the major political parties, but in the meantime thanks again for voting for PC Pilot – you know it makes sense! We'll see you in Issue 12, which should be hitting the shops around August 17th.

Dermot Stapleton
derm@pcpilot.net

COMMS

FROM: William H.S. Goldie

I am a very dedicated pilot of Wilco's B767 Pilot in Command (and no, I have no connection with the company whatsoever, unfortunately). I read and re-read your review on this software in Issue 10. On page 25 you indicate there may be glitch in the zero fuel weight.

I'm happy to say this isn't so. If you ensure that the Options/Settings/International/ menu is set to 'US SYSTEMS' the zfw will indeed be 245 lbs. However, if you have this setting at 'Metric' it will be 111.1 kg. This is an option chosen from FS2000 – I'm delighted to say there's no problem with the zfw in B767 PIC.

As an addition could you please mention that I'm currently attempting to establish a new VA, surprisingly enough Wilco Virtual Airlines. There is one dedicated B767 from the Wilco package, which is used.

The main part of this VA is to have the pilots make check rides, etc and have them fly the aircraft that aren't in 100% satisfactory condition. It's just another attempt at bringing more realism to the VA world. I've been in contact with Wilco and they are happy with the use of their logo on my site.

We reply:

Thanks for helping with the zero-weight problem. Anyone who wants to join William's VA should check out his website: www.whsgoldie.pwp.blueyonder.co.uk/wilcova.htm

FROM: Derek Swanson

Although I've been simming for a couple of years, one thing still evades me - an acceptable descent rate at touchdown. I mainly fly military prop aircraft in FS98 and desire 'realistic' landings. From the articles in PC Pilot you appear to know what you're talking about - can you advise on data for both 'light' and 'heavy' aircraft? I estimated (from a gut reaction) that anything under 60ft/m would be 'excellent', under 120 ft/m 'good' and 180ft/m 'acceptable'. The rate on crash detect appears to vary with the various aircraft I fly and I assume this is programmed in the flight model somewhere. Anyway, If you could help, or point me to someone who can - I'd be very grateful.

Stephen Heyworth replies:

Whilst the aircraft manufacturers will have used a maximum rate of descent when designing their aircraft, it is not a generally used figure for the types of light plane we fly, so we can only answer in general terms. In real flying:

(1) The final stage of landing is normally by feel and learning rather than by reference to instruments and it varies from plane to plane.

(2) On light aircraft, hold the plane about 1 foot off the runway by easing back on the joystick. Keep doing this until the nose is high enough to guarantee that the main wheels touch first (or all wheels will touch together in a tail wheel aircraft), then let it settle onto the ground. Your target here is probably closer to 1 fpm than 60 fpm!

(3) On jet aircraft, fly down the ILS and just before the main wheels touch the ground, pull the joystick back a tad to slow the descent.

The various simulators around should all accept these methods, with the exception of Falcon 4, which appears somewhat over-sensitive to landings. The simulators are likely to have a maximum speed programmed into them, however this is rarely published, but if it is too low it can give the simulator pilot problems. For all aircraft, if you land on the main wheels first (except tail-draggers as above), you will be generally OK. The other main point is to use a long final approach and fly it smoothly, if you are all over the place on finals you will stand no chance unless you are very confident with your landings.

FROM: Bill Garnsey

I was hopeful of tapping into your expertise to see if there is an answer to what I hoped to be achievable. All of the articles about dual monitors so far published show undocking a view as being the answer and putting this undocked and therefore DIFFERENT view on the second monitor. What I am asking about is a variation on this, namely the possibility of showing specifically the forward views on two monitors of captain and co-pilot forward views including scenery and panel giving a large wide forward view. Perhaps this cannot be done and if so I have to accept this, but I cannot let this go without asking you if it is in any way possible.

Christopher Jarman replies:

You may know all this already but we have been experimenting and have come up with this interesting procedure that may go some way towards your requirements. In the screenshot(s) of a Cessna 152 over Hong Kong. You can see forward and both the left and right views as you fly. It is possible to have the two ¼ forward views if you wish.

1. If you click on Views on the tool bar and de-select full-screen the main window will undock and work better. With full-screen selected this method will not work.
2. Hit the left square bracket key [and a small view window will appear. Right click the mouse on it and select undock. Repeat this so that you have two such view windows.
3. Select the first one and drag to the second screen. Mouse-grab a lower corner and pull it out to the size of the screen.
4. Using the number pad on the keyboard, right select any view that you want. At first the view will disappear when you take your finger off the key. So push Num Lock while holding the view and it will become permanent. It will also stay dynamic. You may have to experiment a bit with Num Lock but it will eventually lock the view.
5. Do the same with the other view window. You can now choose as many views as you wish and place them anywhere you like and make them any size.
6. Use the right hand square bracket] to close these windows. You do not need dual screens for any of this but the extra space helps.

FROM: Jim Giordano

I am a current subscriber to your magazine and all I can say is that I love it! If any dedicated flightsimmer would help me find a decent B-25 panel for Flight Simulator 2000 Standard to go with Roger Dial's astonishing design, that would be appreciated.

We reply:

We went straight to the horse's mouth and asked Roger Dial – he advised: "I think I found a panel that will fit the bill at http://b17bigbirds.homestead.com/b25panel.html

"I just put out a new P-38J-25-LO Lightning that you're welcome to use in PC Pilot if you have a place for it. I've also included patches for older 3Dfx video cards, and a patch for Win2K users at http://thehangar.dogfighter.com/CFS-2/Aircraft/BA-P38J/BA_P-38J.htm" Many thanks Roger!

FROM: Laurie Aland:

Thanks for some great downloads of aircraft, scenery etc., but I am having a problem with one of them in your last issue (number 10). The download is AirFleet Manager on page 63. I have been to www.avsim.com but could only find Hangar Manager Version 2.4 and then only the listing of it, not the download.

We reply:

Ooops! A Gremlin must have been at work after we laid out the page. You should be able to do download AirFleet Manager from www.avsim.com and the filename is afm0102.zip.

NEWS

SOCAL Social

Registrations are now being accepted for the SATCO Palm Springs Convention (a.k.a. SOCAL 2001) to be held between 20th and 22nd July. They will be having guest speakers, demonstrations and a dinner on Saturday 21st July with many prizes to be given away all day Saturday courtesy of their participating sponsors, including PC Pilot, SimFlight.net, Clearance Unlimited, SATUSA and many more. They may also have a few surprises in store, so don't miss out! If you are interested in joining them in Palm Springs, you can visit the website at www.ldwilliams.org/socal2001, where there's information about the convention including a registration form, dinner menu, meeting agenda, map and many links to various related sites.

Simmers Helping Simmers...

We recently heard from Jonathan Winn from the J-Planes group – they designed the great 707 that was in our Issue 10 Downloads. Jonathan has told us about a new project called the FSPA (Flight Simulation Pilots Association). He told us: "We have been open for a short time and we've already received hundreds of applications. We are soon going to open features like an online database where flight simmers can find help from people who know things about topics they are confused about - such as landings and navigation. The 'flightsimmers helping flightsimmers' aspect is only one of the features that we'll offer as well as chat rooms and forums, all about to open for free in the only international association for FS pilots. The FSPA can be found at www.FSPA.cjb.net

Fighter Ace III

Microsoft has recently announced some details of the latest version of their popular online combat sim, Fighter Ace. The development team for Fighter Ace III will be headed up by Tucker Hatfield and Rich Teachout. Their brief is to make the game easier for beginners to get involved, while at the same time adding complexity and detail for the expert. As Tucker was Program Manager for CFS2, we reckon he should be able to pull off this tricky order.

FLY!II - WAS IT RELEASED OR DID IT JUST ESCAPE?

With a hushed fanfare of tin whistles, it was announced to those in the know that Fly!II was out on 29th April. However, don't start looking for it in the shops, as there's no European release yet. We had a chat in mid-May with Terminal Reality at the E3 show in Los Angeles and all they could tell us was that a release in Europe is planned for 'July'. The boxed version released in the US seems to be a triumph of marketing over production. There is no manual, not even on CD (it's being released in dribs and drabs online) and many of the aircraft and scenery sections are also being put out as downloads. The first two patches are already around (we've included the first one on our cover CD) and we're already told that there are a few bugs. So, we can only wonder why Terminal Reality have chosen to release what appears to be an unfinished product. We can only hope that when (if) Fly!II is eventually released in Europe, it's as a finished product, not this hastily

cobbled together sequel to Fly! It's interesting to note that the flight sim websites have (generally) avoided conducting a full review of Fly!II because it's so 'unfinished'. The same is true for PC Pilot – we'll take a look at it when you can buy it, or at least when all the patches are out. If you want to get hold of a copy of the US version, our friends at Simware (www.simw.com) are importing them and you can get your paws on one for £30.50 plus postage.

FOR THE TEC(H)NICALLY MINDED!

Tecpilot (www.tecpilot.com), a new site run by our Consultant Editor Mike Clark, will be up and running on 30th June. We're promised a huge amount of online resources for simmers, Mike's very own DNET database system, with charts, specs, contacts and more. There's also the Good Flight Simmers Guide – Mike's book on flight simulation, which will be regularly updated. www.tecpilot.com will be a 'pay-for' site, with subscription starting at a modest £10 per year. Mike kindly gave us a sneak preview of the site and in the screenshot we've taken, you can see the full specifications for the 747-400 – essential stuff for anyone who wants to model their own aircraft. Whether you're a professional developer, or just a

flight simmer who wants to scratch below the surface of this huge topic, Tecpilot looks like it will soon be on your favourites list.

Classic Hit Parade for Just Flight

Flight sim publisher Just Flight (www.jusflight.com) have announced that they are releasing some of their all time favourite expansions in a new range called FS Classics. Popular titles such as RAF2000, Luftwaffe Collection, Airbus 2000 SE and Classic Airliners will be sharing a hangar with the Phoenix catalogue that Just Flight have recently acquired. The Phoenix contributions to the FS Classis range will include 757-200, Executive Jets and Guardians of the Sky. There will be twelve add-ons in the complete range and they're all priced at a competitive £9.99. Just Flight's Managing Director, Mungo Amyatt-Leir was in a buoyant mood at the E3 show recently where he told PC Pilot that Just Flight is flying high in the ChartTrack table – the software industry's equivalent of the record Top Forty. "We've bucked the general slowdown in the leisure software market and at number 35, we're one place below Disney - a great showing considering ChartTrack includes Playstation, Nintendo and Sega, not just PC titles."

Tora! Tora! Tora!

As you read this, the latest Hollywood blockbuster, Pearl Harbor, should be showing at your local cinema. As well as the surprise attack on America's largest naval base, fully re-created in CGI by the same team that brought us Independence Day, there's a love story, some action from the Battle of Britain (via an Eagle Squadron volunteer) and the ubiquitous 'bloke in a vest' firing a deck-mounted machine gun at the approaching Japanese aircraft. All good comic book fun, but if you want to join in the action yourself, Flight One have come to the rescue and announced that they will soon be bringing out a Pearl Harbor expansion for Combat Flight Simulator 2. As the actual attack was famous for being rather one-sided, you won't find squadrons of Mustangs, Lightnings and Spitfires available to send the Honourable Sons of Heaven crashing into the sea. Authenticity

is the name of the game and they'll be including some incredibly detailed scenery of the Pearl Harbor area, with realistic features based on actual 1941 harbour charts and photographs. The aircraft will be strictly those around during the attack, including the P-40 Warhawk. Steve Halpern of Flight one told us to expect historically accurate missions and unique 'what if' scenarios that 'may' have altered the course of history. It's promised for release later this summer – keep an eye on www.flight1.com for more details.

Users can make news at simFlight

Latest news from the simFlight Network is that their main websites, www.simflight.com and www.simflight.de are now both totally database centred systems and so all displayed web pages are generated by the database.

What this means for their viewers is that the system is now open to users for direct interaction. As simFlight's Miguel Blaufuks told us: "This is a great step forward - the 'comments' system offers the possibility of theme based discussions right from the main page. Anyone can now voice his or her opinion right there. Our users can now also submit news, announcements and even rumours, themselves. This information is fed into the database through a convenient mask and served to the editors' desks in minutes."

For users this is going to mean that you'll see fresh content every time any of simFlight's web pages is called up. Also, anyone can participate in the news making system and you'll be able to customise the contents of simFlight's main page and make it a personal homepage showing only the topics you want to see. A good example would be altering the page so that you only see virtual airline news. Unlike some sites, there's no need to register before browsing through simFlight's content but once registered into the system, users can enter their nickname, personal information and edit their own signature.

Maple Leaf Museum

Bert Fletcher, one of our many Canadian readers, wrote to us about the British Columbia Aviation Museum at Victoria B.C. He told us: "A nice, friendly bunch runs this place. Many are WWII veterans and a lot of fun to talk to, especially when you get on the subject of aircraft maintenance." Among the exhibits is an Avro Anson that the museum plans to restore in its training marking as a tribute to the many aircrew who trained on Ansons in Canada. Their website is www.bcam.net and although it's a tad far for a daytrip, it's worth a visit if you're on holiday in this part of Canada.

No G800 From Matrox

There's a bit of sad news for Matrox fans and that includes many of us at PC Pilot. The G800 everyone has been waiting for is officially not going to be released. Matrox is continuing their stance that they will re-enter the gaming market at some point, but we're told not to expect that it will be with their next card. Their recent G450 has been pitched more at business users than gamers, which may be part of a shift in emphasis, although there's nothing official on their site – www.matrox.com

Clubbing Together

We've just heard about a new club for UK flight simmers. The UK Pilots Club (www.ukpc.cjb.net) has been set up with the object of providing its members with a dedicated site to use for meeting other like minded people and doing what they love the most – flying. The UK Pilots Club intends to create regular flights for its members to participate in, a monthly newsletter, air races, trips and adventures. Although based in the UK, they welcome any members who are happy to fly within GMT schedules. All enquiries should go to ukpc1@hotmail.com.

Micro-Flight 2 Released

Ilan Papini recently announced the release of Micro-Flight 2. We featured a demo from this fascinating 'light machine' sim on the Issue 10 CD. Four months of continuous development brings some exciting new features like transparent clouds with new settings, additional thermals, moving parts, controls (trim, gear, flaps), panels and instruments. There's also a new is parachute option, autogyro flight model together with autogyro, a new helicopter flight model, a new helicopter and more. Further information is available at www.hangsim.com

Free Charts

You may or may not know that you can get all the official UK aerodrome plates as published in the AIP for free (well the cost of your IP) from the National Air Traffic Services website. Many of our readers have recommended this service, including Olaf Albers, a commercial pilot who dropped us a mail with the necessary link. Olaf advises that you'll need Acrobat Reader to view them and the address is: www.ais.org.uk

Wire and Canvas Website

The Aerodrome WWI flight sim website, which was featured in the News section in Issue 9, have advised that many of their popular aircraft downloads are now being 're-manufactured' for CFS2. This is great news and means that WWI fans will be able to take advantage of Microsoft's new combat arena. Get downloading from www.aer.ip3.com

Don't Mention The War

Recent reports of a proposed new PC Game '1946: Hitler's Revenge' have caused a bit of a stir. This WWII title, by Victory Interactive covers what might have happened if the Luftwaffe had fielded some of their experimental planes. We seem to remember that Lucas Arts were there, back when Noah was a sailor, with 'Secret Weapons of the Luftwaffe'. The developers have slipped into hot water by using the words 'Hitler' and 'revenge'. A flurry of e-mails, suggesting that the title is in bad taste have been flying around. Rumours that it will be re-named "Noddy and Big Ears Fly For the Fuehrer" have been strongly denied! Read all about it at www.simhq.com/simhq3/sims/previews/1946revenge

Spanish Flying

Latest news from www.sim-wings.de - the team that brought us Ibiza 2000, is that they've added Menorca and Santander International Airports to their library of Spanish scenery for Flight Simulator 2000. Both airports are well detailed using high resolution mesh terrain techniques and the team have used their own photos for total authenticity. The dramatic approach to Santander over the mountains is likely to be a real treat for flight sim pilots.

FlightSims.co.uk

Adam from www.flightsims.co.uk asked us to pass on a "big thank you" to all those who have stuck with him through a recent spate of server problems. He says the site is now fully back on line with new servers and a re-vamped design, so that simmers can get their every wish fulfilled (well, almost) from this Manchester based site.

To pay or not to pay?

The battle lines are being drawn in the virtual community between those who feel that everything on the Internet should be available for free and the growing band of sites that are charging visitors to see the fruits of their labours (and enjoy the width of their servers!) We asked Doug Helmer from www.combatsim.com - a site that has recently gone over to a subscription service – to give us his opinion on the way the Internet is changing.

A Polish proverb says "Under Capitalism man exploits man. Under Socialism the reverse is true." This pretty much illustrates the problem with the Internet these days - whether online content remains free (Socialist) or starts costing money (Capitalist). Either way, somebody thinks they are getting screwed.

Recently, I saw that www.avsim.com's Tom Allensworth and Mike Clark of www.TheMag-FS-News.com (and PC Pilot), had a falling out over the fact that Mike's new website called - www.tecpilot.com would be a 'pay-for' site. It seems Avsim felt uncomfortable giving their free content to an organisation that charges readers for access, and well they might. Their differences regarding free vs. pay-for content was just the latest such incident since December 30th, 2000 when the whole free vs. pay debate that angered many first began. Why such a specific date? Well, that's the day I shocked not only the online combat simming community but the entire online game info provider/consumer world by converting my site, www.combatsim.com, from a free access site to a pay-for site.

In the Avsim vs. Tecpilot dispute, Avsim's head said in a post on his message board, "We wish Mike well and hope that Techpilot (sic) succeeds for him. The model of pay for service is interesting, and we look forward to seeing how he does with it." Rest assured, Avsim is not the only site doing some serious watching. As the first 100Hot.com ranked game information site owner to convert from a free content model to a pay content model, I can speak with some authority on this subject. Perhaps, with this article, I can save my fellow top-ranked site owners some sleepless nights, while reassuring the regular visitors of these beloved websites that the news isn't all bad.

Banner advertising.... was a flop

First of all, how did we get to this pay-for content situation? It's no secret that the banner advertising revenue business model for sustaining successful websites was a flop. The economic laws of supply and demand finally caught up with the Internet: when you have almost as many web pages serving up banner ads as there are grains of sand on a beach, the unit price per ad drops to virtually nil, no matter how niche your website might be.

This Internet economy turnabout occurred just when sites like mine were hitting their stride and receiving hundreds of thousands of monthly visitors. Each month, these info hungry visitors were devouring millions of gigabytes of data in the form of free articles, images, and downloadable files. Problem was, every byte of that data transferred out cost real money. The arithmetic was painfully simple: no money in from banner ads each month and tens of thousands of dollars (pounds…roubles..) out in bandwidth and overhead costs each month. And that, in a nutshell, is how we got here.

What, as a site owner, can you expect if you convert to a pay-for site? Well, luckily for you I've already absorbed the brunt of the online community's indignant outrage over charging for access, but don't expect an easy ride. Depending on the composition of your content and how you set things up (some content free, some pay-for) you can expect to lose between fifty and ninety-nine percent of your regular visitors. The good news is that your basic bandwidth and maintenance costs will also drop by a similar amount.

When it comes to implementation, you'll want to give your readers plenty of time to come to grips with the situation. However, if you get a run on your servers, as we did when thousand of readers tried to download everything in sight, you may have to shut of the free spigots earlier than you planned. A few brave site owners with whom I've have been in contact, imposed a volunteer payment system but the early reports show that this approach doesn't bode too well for that method. Sadly, I fear, good intentions can't sustain a popular website.

Thankfully, the online community is starting to understand the dire economic realities of the Internet, what with the recent closure of the wildly popular DailyRadar.com (seems it is back online, but only just) and the announcement of pay-for sites like TecPilot.com. In fact, Imagine Publishing's former staff from the hilariously irreverent 'PC Accelerator' magazine have announced plans to create an online version of their now defunct print magazine and it'll cost $60 US per year for access.

On the technical side, setting up a pay-for site is no walk in the park. Your site's vast directory structures may have to be altered and site access security and hacker attack issues will have to be addressed. There are a variety of ways you can implement your e-commerce too. Expensive no hassle options and inexpensive huge hassle options abound. Do your research before you announce your plans to charge because what you charge will depend on what e-commerce system you use.

A pay-for site is no walk in the park

On the PR/service side, once you start charging you'll have to treat your readers, who are now customers, with the respect they deserve (which you've probably been doing all along, or you wouldn't be in this popular site/no revenue predicament, right?).

Now to you faithful fans of online game sites. Like I said at the beginning, the news isn't all bad. Most sites, whether they are pay-for or not, should still offer their file downloads for free. Even though we house most of the files we list in our downloads database on our own FTP servers, we do not charge for access because we didn't create the files in the first place. Charging for access to someone else's skins or add-ons just wouldn't be cricket.

Also to the good, the vast majority of the thousands of independent fan sites devoted to a few sim titles should continue to stay free. The only fly in that ointment I see is that many of these sites are hosted by free Internet hosting sites such as NBCi and Yahoo/Geocities. These sites, may, one day, start charging basic fees for server storage space and bandwidth used. If not, they may start generating so many ad banner pop-ups as to make the experience of visiting such a site hardly worth the effort.

Not surprising, many corporate game and hardware companies are now going all-out to develop full-featured, totally free game info and online communities of their own. You just have to look at the www.Thrustmaster.com, Flanker2.com and the www.BlueByte.com IL-2 Sturmovik community sites to see this.

Finally, for those outspoken stalwarts of all sim and PC gaming communities, the message board regulars, fear not. The Usenet groups should remain free (although I still wonder who pays for all that bandwidth).

Sadly, the love fest of the Free Internet will just be another memory like the Free Love movement of the sixties. And mark my words, many of the outspoken message board activists who currently espouse (and demand) a free Internet today will eventually change their online nicknames and quietly start pay-for content services of some kind and never look back. All of us will become potential customers instead of just a pair of 'eyeballs' and we'll get better quality content than ever before and for reasonable prices.

I love the Polish, and their vodka, but capitalism, when done right, is good and nobody gets exploited. ■

Doug Helmer

Doug can be contacted by e-mail at publisher@combatsim.com

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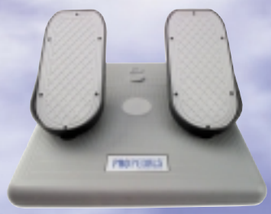

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A huge collection of shareware to try before you fly
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EUROFIGHTER ROLLING DEMO
Sit back and watch this beauty put through its paces
TUTORIAL CHARTS
Ready to read in PDF format
LATEST UPDATES FOR JANE'S USAF AND F15TH

Our latest CD is jam packed with goodies, from excellent freeware aircraft to the huge Speech SDK5, and all designed to save your phone bill from a fate worse than death. To get the CD running close all programs and applications and place the PC Pilot CD in your CD-ROM drive. If Autorun is enabled, the program will start and you will see the opening screen and menu buttons. If you don't have Autorun activated, or the D doesn't start automatically, press the 'start' button on your Windows taskbar, move up to 'Run' and left click on it. Type in the 'Open' window: D:/menu11 (where 'D' is the drive letter of your CD-ROM drive, then press OK and the menu should appear. If all else fails, go to 'My Computer', right click on the CD icon and select 'explore'. You should then be able to open up the folders as required.

FREEWARE FEAST

As a special treat for this CD we've got some brilliant aircraft for you, courtesy of some of our good friends in the freeware community. If you're new to this concept, freeware aircraft (and panels, scenery, utilities etc.) are developed and put on the Internet for anyone to download for free. The quality often surpasses that of commercial products, but the only snag is that you need an internet connection and even if you've got one, it can play havoc with your phone bill. Most freeware aircraft are compressed using Winzip (if you haven't got it, you'll find it on this CD) and you'll need to unzip the various files into the correct folders in your flight simulator. There should be a readme file inside the zip which will give you instructions on how and where to put the various files.

Red Arrows Hawk

This BAe Hawk By Mikko Maliniemi has been repainted by Owen Hewitt as Red Arrows aircraft XX307 that joined the team in 1996. You'll also find Aaron Swindle's sound package for this aircraft, as recommended by Owen.

PC PILOT RAF 2000 TOKEN 2
See page 11 for details of how to claim complete version

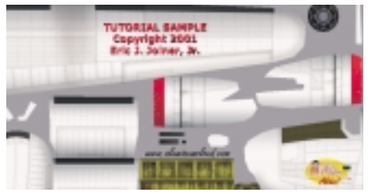
Shigeru Tanaka's Freeware

Shigeru is famous for his aircraft designs and as well as freeware he has also designed aircraft for a number of commercial add-ons, including RAF 2000 and Korean Combat Pilot. In this collection we've got his award-winning F-117 Stealth, an F-4 Phanton and a Beagle B.206 Basset, all for Flight Simulator 2000. We've also included something for FS98 users. Shigeru has modelled an interesting ST2007 'Yuka II' supersonic aircraft that's supposed to be appearing in

the skies in six years time. You can read all about Shigeru and his aircraft at www.flightsimnetwork.com/shigeru/

Eric Joiner's Freeware

Eric's freeware website is called www.aluminumcloud.com, which may seem unusual, but Eric explains "The name



'Aluminum Cloud' was a nickname given to the Convair B-36, due to its huge size and bare metal livery. As you'll find a good portion of my work is dedicated to bare metal...it kinda fits!" Eric's got some great aircraft liveries for CFS2, X-Plane and Falcon 4.0. We've chosen three from his collection – the first is a B-25 Mitchell in pre-war bare metal livery for CFS2. There's an SBD-1 Dauntless, also for CFS2 and an A-36 Bonanza for X-Plane, originally created by Mitsuru Ishikawa that Eric has repainted.

FLANKER 2.5 UPGRADE

A few months ago SSI released their long waited add-on for Flanker 2.0. The list of features includes the ability to fly the MiG-29K (navalised version), the ability to set waypoints for ships and ship to ship engagements, IFR (in flight re-fuelling), and an improved view system.

Furthermore, wingman control is expanded, with additional scenarios and a new campaign also included. The update patch is 76+ Mb, but we've included it here by popular demand. By the time you read this, the update to 2.51 will be available at www.flanker2.com. Because of space limitations we've not included the versions of the upgrade for Voodoo cards. Hopefully we'll be able to put these on a future CD.

Note that you must be using DirectX 8 for 2.5 to operate properly. DX8 is available at www.microsoft.com/directx, but to save you the bother, you'll also find it on this CD. You may also have to reinstall your joystick settings in Windows Control Panel.

Unzip the archive and make sure the files go in the proper directories - Flanker.exe and joy2key.dll both belong in the Flanker 2.0 home directory.

SIMMARKET SHAREWARE

Our friends at www.simflight.com have provided us with a huge selection of shareware for you to try. There's aircraft, airports, scenery, utilities… in fact everything for the flight sim enthusiast. Most of the files should have instructions for registration, otherwise check out http://simmarket.com.

EUROFIGHTER ROLLING DEMO

If you want to see how good Eurofighter Typhoon looks in action, rather than on paper, we've got a great rolling demo for you to watch. Take a back seat and see this brilliant new sim put through its paces.

TUTORIAL CHARTS

To make things a bit easier we've included our latest charts as PDF files. These can be read (or printed out) using Acrobat Reader and in case you don't have it we've included it on the CD. The charts are for Humberside Airport, Norwich Airport and Norwich approach. These are the latest Jeppesen charts as used by real pilots and for the actual tutorials we use the Jeppesen SimCharts program.

To access the charts, go to My Computer and right-click on the CD icon. Select 'Explore' and you will see all the folders that are on the CD. Open the 'Charts' folder and double click on the required chart.

UTILITIES

Adobe Acrobat - If you haven't got Acrobat Reader, you'll need to install it from this folder in order to read or print out the tutorial charts.

Winzip 8.0 - You'll need this installed before you can open any of the zip files on the CD. Please note that this is shareware and you should register and pay if you want to use it on a regular basis.

Peter Dowson's Utilities - All the latest versions of Peter's handy freeware utilities for Flight Simulator, including WideFS 4.40, AdvDisplay 1.60, FSUIPC 2.40, AutoSave (for 767 PIC) and many others.

IMPORTANT - TECHNICAL SUPPORT

The CD and software on it is free and as such, PC Pilot, nor any of the publishers or developers of the software supplied on the CD can provide technical support. The software is supplied very much 'as is' and without support. Enjoy the CD and the software on it!

OTHER PATCHES AND UPGRADES

Fly! II Patch

It may not be in your local shops yet, but the first patch is out! As well as fixing a number of minor bugs, this upgrade also improves frame rates on higher-end systems.

Direct X 8.0a

This version is for Microsoft Windows 95, Windows 98, and Windows ME. The DirectX installation process requires approximately 50 megabytes (Mb) of free space on your hard drive. After installation, the DirectX download takes approximately 15 Mb of hard drive space. If you have an earlier version of DirectX installed on your system, you will see little difference in used space on your hard drive following installation of DirectX 8.0a. DirectX 8.0a will overwrite the earlier versions. Please note - after installation, the DirectX 8.0a run time cannot be uninstalled. The installation process changes core components and makes numerous registry changes within your operating system. Microsoft does not support uninstallation.

X-Plane 5.66

With the last X-Plane upgrade we included (5.62) Windows users may have had problems because it required Direct-X 8.0 and also Microsoft Text-to-Speech Version 5 (you've probably got version 4). So as well as the latest version on this CD you'll also find Direct-X 8.0 and Microsoft's Speech SDK5 - this should save you over 200Mb in download time! We've also included the full Mac version of 5.66.

Jane's USAF Patch

By popular demand we're including this 12Mb patch that upgrades Jane's USAF. To read about the features check out www.janes.ea.com.

FREE SOFTWARE OFFER

In the last issue of PC Pilot we gave away twelve of the aircraft from Just Flight's popular add-on, RAF 2000, on our cover CD. We also included an RAF 2000 token on page 10 and you'll find the second token on page 10 of this issue. To get a complete version of the program, with all 25 aircraft, simply complete this form and send it, together with both RAF 2000 tokens (originals only of the tokens, but you can send us a photocopy of this form) and £3.00 (£5.00 for overseas readers) to cover postage. Don't worry if you haven't got both tokens – send us the one from this issue, £4.99 plus postage and we'll send you a copy of RAF 2000.

Name (Mr/Ms)

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DFSO FLIGHT SIMULATION WEEKEND

Simmers gather in Schipol

On the last weekend in April the DFSO (Dutch Flight Simulator Organisation) Flight Simulation Weekend took place in Amsterdam, and what an event! Anyone familiar with the 'bring & buy' or 'swapmeet' feel of UK events would have been amazed by the highly impressive show put on by Dutch enthusiasts. The show runs over two days, attracts over 2,000 visitors and is held at the Aviodome Museum at Schipol Airport. One of the best features of the show is that displays and exhibitors are located right through the museum, amongst the museum exhibits. "Looking for joysticks? Try the stand in front of the Sopwith Camel, just before you get to the Spitfire."

This makes for a great atmosphere and your visit to the show is made even more interesting by a simultaneous visit to a fantastic museum of aviation. Holland is the home of Anthony Fokker and KLM, so with such a great flying heritage there's plenty to see in the museum. However, once the Dutch flight simmers have taken over, there's so much to see, you will struggle to do it all in a day.

We took the PC Pilot 'roadshow' to the Aviodome on Friday afternoon, travelling via the Channel Tunnel. A drive across Holland to Amsterdam didn't take too long (and there are no tolls!) and we arrived at Schipol in the evening. Bob Iken, who did much of the organising for the event and Raymond Oostergo of the Aviodome met us at the door and even helped us unload and set up – that's a first for any show we've ever attended. The show started on Saturday and we were ably assisted by Okke Versteegh of the FSGG, who took care of some of the awkward questions and also helped us create a rise in world coffee prices! The main focus of the show is demonstrations by regional flight simulation clubs, virtual airlines and other organisations. At the same time a number of guest speakers lectured in a large open area and there were some live demonstrations on an overhead projection monitor, including the first outing for DreamFleet's new 737-400.

Most of the activity on the PC Pilot stand consisted of enquiries from friendly Dutch readers who wanted to know where they could buy PC Pilot in Holland. It was very heartening to meet so many of our readers and good to hear that large numbers of them have been reading PC Pilot from Issue 1. With our egos suitably swollen, we returned home and our only disappointment was that we hadn't attended the show before.

We'd strongly recommend British flight simmers to take a trip to the next show in October, when the focus will be on cockpit building. With budget flights available to Holland, it could prove cheaper than visiting a UK show. The museum is within walking distance of the terminal and even if you can't make the next show, a visit to the Aviodome Museum is a must. We'd like to express our thanks to everyone in the DFSO, the FSGG, EuropAir VA, AUVA and the Aviodome who helped to make it an extremely successful weekend. To see more from the show and read some of the many glowing reports, take a look at the DFSO's website www.dfso.nl

Dutch flight sim enthusiasts put on some great displays while the English barrow boys hawked their wares from an open suitcase and kept a lookout for the law!

More than just a hobby (shop)

No trip to Schipol would be complete without a visit to the most incredible 'Aladdin's Cave' for flight simulation, the Luchtvaart Hobby Shop. This amazing place is only a short distance from the Aviodome at Schipol and if you're visiting the museum or waiting for a flight, it's only a ten minute ride away. However, we should warn readers that there is so much to see (and buy) for fans of flight simulation and aviation, that you're unlikely to get away with just browsing. Unless of course you have very strong will power. As well as every conceivable piece of hardware and software that you'd ever need, there is also plenty of other things to attract the roving eye of anyone with an interest in flying. The word 'Luchtvaart' is Dutch for 'aviation' and we can only say that the shop is well named. We don't usually indulge in providing free adverts, but after a short while in the shop with Dennis (the manager) we thought this was a place that UK simmers need to know about. It's worth a visit just to see their DC-3 cockpit. Their website is at www.lhshop.nl - now, where's that credit card….

Dangerous territory for a flight simmer with a credit card!

We can't work out if it landed in the shop or if the shop was built around it

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Show-room/shop/training center open from Tuesday to Friday (2-6 pm GMT+1) and Saturday (10 am- 1pm and 2-5 pm GMT+1)

Flight Simulator Add-ons
767 Pilot In Command (Wilco Publishing) 767 Pilot in Command gives desktop pilots a series of nerve-wracking lessons in the art of managing aircraft problems, ranging from tire blow-outs, blocked gears and windshear to electrical failure, cabin depressurization and engine trouble. €23.95=€36,94
747 - 400 Pro (Phoenix) From the developers of the incredibly popular Concorde expansion and Boeing 777-200 PRO for Flight Simulator comes the most realistic aircraft ever to fly in Flight Simulator 2000. INCLUDES FREE VHS (PAL) 60-MINUTE COCKPIT VIDEO. EXCITING AND INFORMATIVE VIDEO FROM THE FLIGHT DECK OF A CATHAY PACIFIC 747-400 AS IT FLIES FROM LONDON TO HONG KONG'S NOTORIOUS KAI TAK. €28.99 = €46,85
ProFlight 2000 (AETI) Flight planner and adventure generator. Controllers switch to proper accent voices when crossing international boundaries. Pilot accents reflect the aircraft's country of origin. £28.99 = €46,85
German Airport 1 (Aerosoft) Munich 2 / Franz-Josef-Strauß Int. • Stuttgart • Friedrichshafen • Augsburg • Bayreuth • Nuremberg • Dresden • Egelsbach • Innsbruck • Altenrhein (Swiss) £24.50 = €39,42
Airport 2000 Vol. 3 (Wilco Publishing) The long awaited Airport 2000 Vol.3 has finally landed ! 7 new airports, 3 new aircraft and 10 adventures fully compatible with prior volumes. £26.00 = €41,89
Polynesia 2000 (Flight World) Welcome to French Polynesia, a world of fantastic atolls and islands! Take your seat in the aircraft of your choice and travel this beautiful region. £19.50 = €38,99
Airport 2000 Vol.1&3 Bundle £28.99 = €46,85 | Corporate Pilot £27.50 =€44,37
FS Clouds 2000 £22.95 = €36,94 | Private Pilot £27.50 =€44,37
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and much more at www.simw.com

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757 & 767 for Fly (Aerosoft/PMDG) Experience the best Boeing 757 & 767 simulations for Terminal Reality's Fly! and Fly2k. The flight models development is based on real data and specifications and brings up a new level of realism. £25.50 = €40,90
Also available for Fly ! - Special Offers :
Rhein - Ruhr (Aerosoft) : £15.50 = €24,54 • 737 for Fly ! : £18.50 = €29,50

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PBY-5 Catalina (Abacus) The "Princess of the Skies" is the Catalina #2V96. The ASSEMBLY WAS here has mastered special techniques including shining landing lights, silky-smooth landing gear motion, working wipers and fully functional cockpit instrumentation. Compatible with FS 2000 and CFS 2. £23.95 = €38,42
B-17 Flying Fortress II (Microprose) The complete WWII strategic airwar simulation with 10 roles on board with real time motion captured characters. Breathtaking air combat sequences over the highest resolution terrain ever seen. £28.99 = €46,85
Combat Squadron (CFS 2) £23.95 - €38,42 | Harrier Jump Jet £21.50 - €34,46
Combat Flight Simulator 2 £27.50 - €44,37 | Korean Combat Pilot £19.50 - €30,99
Battle of Britain £28.99 - €46,85 | F/A 18 (Jane's) £19.50 - €30,99

Civilian Simulators
X-Plane 5.x (Laminar Research) X-Plane uses blade-element theory to simulate almost any aircraft conceivable... just enter the dimensions of the aircraft that you want to fly and go flying! £43.95 = €69,16
ATC Simulator (PC Aviator) Dim the lights... take a seat.... and prepare to challenge yourself in front of the scope of the most complete and most authentic Air Traffic Control simulator you'll ever experience on your PC. £44,95 = €74,12
TRAIN SIMULATOR (Microsoft) There is a magic and mystique about trains that is difficult to explain... Price on request
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Force - Feedback Yoke (BKcase Avionics) The force-feedback yoke allows the pilot to fly with complete control. It's a perfect trainer, simulating a real environment. This yoke has electric commands for autopilot engage/disengage, pitch trim, and push-to-talk. It is delivered with brackets. £567.69 = €914,73
CH Flight Sim Yoke (CH Products) Ergonomic designed yoke movement without a center detent allowing the ultimate in control. Programmable through software. PC (1 lever) : £302.99 = €165,84 USB LE (1 lever) : £ 107.99 = €173,28 USB (3 levers) : £122.99= €198,07
AFCS (AETI) Compatible with all simulators, this yoke is probably the most realistic on the market. High quality steel and aluminum construction & components. £468.00 = €741,20
Jet Studio (Safeline) This Jet Studio reproduces main controls of a real aircraft. It is the only product that simulates real Jetplanes throttles with reivers levers. 6 different consoles are available at different prices. From £352.50 to £860 (€567,68 - €1385,72)
CH Pedals £64.50 = €103,87 | CH Pro Pedals USB £116.99 = €188,15
CH Pro Pedals PC £91.99 = €148,49
Special prices for full configurations. Please contact us or check our website !

Accessories
Keyboard Cover (Cockpit Collection) The Keyboard Cover is a soft elastomer plastic skin that fits over regular shaped keyboards. The skin is printed with highly detailed text and graphics which are fitting exactly above the appropriate keys. Just place it on top of your keyboard and you're ready to play in seconds. Available for all flight simulators.
SIMCharts (Jeppesen) Edit and print worldwide charts (14 different areas) £19.95 = €31,98 SIMCharts Upgrade 1.5 £8.50 = €13,63
Game Commander 2 (Mindmaker) GC is a voice command input application that takes you to the next level of PC gaming. It saves you from the myriad of awkward keystrokes used in today's sims by assigning voice commands to them. You want your troops to attack? Simply say, "Attack!" £27.50 = €44,37

Racing Simulations
Colin McRae Rally 2.0 (Codemaster) The Greatest, The Fastest, The Best one ! Look left then right, DON'T CROSS THE STREET ! Colin McRae Rally 2.0 is coming on your PC. £28.99 = €46,85
Speedway Racing Wheel Solid steel construction with a cast aluminium wheel and black leather covering. 540° rotating wheel. Formula 1 type gear lever, easy to Fix, game port compatible. The highest quality available ! £140.99 = €226,82
Hard Truck 2 £32.99 = € 36,94 | Nascar Heat £33.95 = €54,29
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Different ways of payment : credit card, postal order, bank transfer. Shipping within 24-48 Hrs over Europe, according to availability. Shipping prices are calculated according to weight and shipping company : Chronopost or Regular Mail.
Example of shipping costs to UK by Chronopost : 1 item = £6 - 3 item = £7. We offer better rates for more than 3 items shipped in the same time. Do not hesitate to call us. GBP prices are calculated from Euro rate on May 2001.

FLIGHT SIMULATOR 2002

Preflight checklist complete?

Virtual cockpit – Check. Clouds – Check. Mountains – Check

It's going to be a long summer for simmers. As autumn draws near, so too does the release of Microsoft Flight Simulator 2002. But not fast enough. From what we've seen so far, this is going to be a landmark release of the biennial classic and we can't wait to get our hands on it. Until then, we decided to go straight to the top and ask some searching questions about Flight Simulator 2002. Bill Gates wasn't available and we figured that Bruce Williams would be a better bet anyway. As Product Planner for Flight Simulations at Microsoft he's responsible for making all the tough decisions and as a pilot of 25 years experience, a flying instructor and ex-editor of General Aviation News and Flyer magazine, he certainly knows his planes…

Show and Tell

PC Pilot: What are YOU most excited about in Flight Simulator 2002?

That's a hard question to answer. The new version is stunningly beautiful and makes the world come alive. If you enjoy exploring the world from a pilot's perspective, Flight Simulator 2002 is a dramatic improvement. I'm also excited about new aircraft like the Caravan on floats, and from a training perspective, flight analysis and the instructor's station are very cool. Of course, ATC is a huge development. It really makes you feel as if you're part of a busy, interactive world.

PC Pilot: The Air Traffic Control is certainly a welcome addition. Will you be able to actually see the other aircraft that are on the radio? Will the ATC voices include non-American accents?

You'll see air traffic if you're close enough! Dynamic air traffic is an integral part of the ATC system, so no matter where you fly, you'll hear and see other traffic. We're including a variety of voices in the ATC system, but you can add 'voice packs' to expand on those included in the product. We are documenting the process for creating and adding voice packs, and that information will be part of the SDK.

PC Pilot: Please tell us about the AutoGen scenery engine? How will this change the landscape as we know it in Flight Simulator 2000?

As you fly above cities, towns, farmland, and dramatic landscapes, Flight Simulator adds buildings and vegetation appropriate to the terrain and geographic region around you. Office buildings, factories, homes, farmhouses, and trees smoothly blend in at the horizon and fill the entire area with detail that adds unprecedented depth and reality to Flight Simulator no matter where you fly. So, even when you're outside the detailed scenery areas where we've manually placed custom objects, you see buildings, trees, etc. that add depth, a sense of speed, and heightened realism. You need a 3D graphics card for this feature and you can adjust the density of the auto-gen scenery to best suit your system.

PC Pilot: Who have you been working with on the new aircraft? How realistic are they?

As always, we work directly with aircraft manufacturers, flight training organizations, and pilots who fly the aircraft that we include in Flight Simulator. We have three aeronautical engineers on the team (two of whom are also pilots), plus many pilots of varying experience who lead and work in every group on the team, including development, program management, testing, user assistance, art, planning, and marketing. Two of us are active flight instructors. We take realism very seriously.

For example, to get accurate engine sounds for the C172SP and C182S, we went to the flight school where I teach

All this, and no stuttering? We hope so

and installed microphones inside the engine compartment to capture sounds for startup, a variety of power settings and shutdown. We followed the same process for the Caravan, the Baron, and other aircraft in the product. We also spend a lot of time in certified simulators to record cockpit sounds and to validate the flight models. And we fly the airplanes ourselves and compare the performance of our models to test data from manufacturers and other sources.

But is it Real?

PC Pilot: Please tell us about any improvements you've made to the flight dynamics?

As always, we strive to improve the flight models. We're fine-tuning many areas on all the aircraft.

PC Pilot: Since it first appeared in FS98 the Bell chopper has been very popular but is still very tricky to fly. Can we look forward to a new, dedicated helicopter flight model this time around?

We've always had a dedicated flight model for the helicopter. The original model was developed by an aeronautical engineer who is also a pilot rated in the Bell JetRanger. He worked closely with Bell Helicopters, and we've followed up with Bell in the interim. We've improved with each release since it appeared in Flight Simulator 98, and we'll continue to fine-tune the model.

I've flown a JetRanger and a Robinson R22 on several occasions, and although I've been a fixed-wing pilot for more than 25 years, I still found those aircraft quite challenging and tricky to fly. I think that much of the perception of the helicopter flight model stems from the fact that flying a helicopter accurately, especially in the hover, depends on seat-of-the-pants sensations and a wide field of view. Sitting in a chair in front of a computer doesn't deliver the tactile feedback you get in the real machine, and until big, wide-view computer displays get a lot cheaper and more practical, it's hard to provide enough peripheral vision and other cues to help pilots fly helicopters accurately.

Coincidentally, this morning I spoke with a former military pilot in Canada who has more than 3000 hours in the JetRanger alone. He thinks the flight model is quite accurate—he wants to use it in a new training program he's developing.

Where are the headlights in this thing?

PC Pilot: The planes in Flight Simulator 2000 (and before) are nowhere as stable in pitch as real aircraft. Can we hope for more realistic stability in the new planes?

I have to disagree with the premise of your question. The flight models in Flight Simulator agree very closely with flight test data provided by manufacturers and they can be trimmed properly. And based on my experience flying many of the real aircraft, our models are quite accurate. For example, pilot-induced pitch oscillations damp appropriately, just as in the real aircraft.

Again, I think some of the perceptions of the flight models, especially with regard to pitch stability, stem from a variety of causes. For example, in a real Cessna, the control column moves a good 12-18 inches fore and aft. We have to scale that movement to match the few inches that most PC-based joysticks and control yokes deliver. That scaling means it's very important to make small, smooth control inputs. It's also important to adjust the sensitivity of the controller that you use. And if you find it difficult to fine-tune the trim, you may want to adjust that setting in the appropriate aircraft .CFG file so that each trim input delivers a smaller

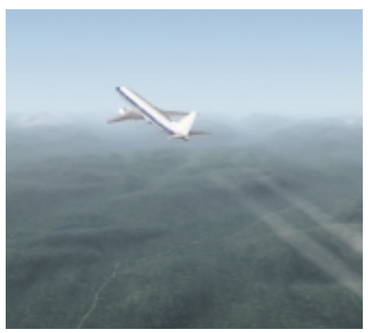
Is it a photo or is it a flight sim?

How green was my valley?

incremental change to the flight model. The process is described in the SDK for the aircraft container system on our Web site. Many people also don't realize that even in an airplane like a C182, a change in pitch equivalent just to the width of the bar on the 'wings' of the airplane in the attitude indicator can translate into a substantial rate of climb or descent. The effect is much more pronounced in high-performance aircraft like the Mooney, the King Air, and the Learjet.

When I demonstrate Flight Simulator at such shows as EAA AirVenture and AOPA Expo, I often observe pilots who have trouble establishing a stable pitch attitude and trimming the airplane properly. But with a little help, they're usually able to make things settle down. The same thing happens in real airplanes, I might add. I spend much of my time as a flight instructor helping people learn to control the airplane smoothly and precisely. And the proper use of trim is a perennial topic of discussion at flight instructor and pilot clinics. It's one of the most misunderstood subjects in the flight-training syllabus.

And for today's flight we have ATC, AutoGen scenery, and more aircraft



Bob the Builder eat your heart out

PC Pilot: What features have you added to help developers create add-ons? Will users be able easily to design and improve the scenery/buildings in their own areas?

The biggest development is gMax, a new 3D modeling tool from Discreet that makes it much easier to create and modify aircraft, buildings, and other 3D objects for use with Flight Simulator. We've also updated the adventure programming language. The new language is much easier to use and includes many more features and we've updated the flight dynamics editor. All of these tools will be available in Flight Simulator 2002 Professional Edition. Aircraft, scenery, and adventures created for Flight Simulator 98 and Flight Simulator 2000 will work with Flight Simulator 2002.

Swim anyone?

We will also publish information about the data stream from the flight analysis feature, the scenery system, etc.

PC Pilot: Is there any facility for organising one's aircraft collection into groups or hangars? For instance, putting all your helicopters in one place?

We're working on an aircraft packaging tool and we've changed the user interface in the Select Aircraft dialog box so that users can sort and organize their aircraft collections more easily.

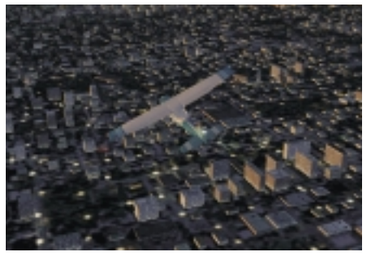
PC Pilot: Will European and UK scenery look as good as the US landscape? Any sign of the Severn Bridge?

We're overhauling all the textures for the entire world. I can't say whether a specific landmark will be included—we have a bunch of artists hard at work on a long list of buildings and other structures. But gMax will make it much easier for both enthusiasts and add-on developers to create and share 3D objects.

PC Pilot: How much backwards compatibility is there? This has been a criticism in the past from users.

Aircraft, scenery, and adventures developed for Flight Simulator 98 and Flight Simulator 2000 will work with Flight Simulator 2002, provided they were developed properly. We constantly test each version of Flight Simulator with a variety of popular add-ons.

Heading to Flight Level Three-Zero


AutoGen scenery – Wow!

PC Pilot: Are you including any juicy extras in the Pro edition, such as a set of air charts/sectionals? Will there be a DVD version?

The Professional Edition includes two additional aircraft, IFR training panels, the instructor's station, an improved Flight Dynamics Editor, and gMax, all of which will make it easier for enthusiasts and add-on developers to expand the simulation hobby. We haven't decided when to offer a DVD version. That depends on market conditions.

Performance, Performance, Performance

PC Pilot: Many people found that their PCs weren't up to running Flight Simulator 2000 when it was released. Do you have a feeling as to whether Flight Simulator 2002 will be a little more forgiving?

We haven't set the final system specs yet. But we're confident that the product will run well on a variety of mid-range systems. Some features (e.g., auto-gen scenery, virtual cockpits, and some special effects) will require a 3D card. We're also working hard to make many of the features scalable so that users can fine-tune their systems to get the best performance.

Isn't this a bit fast for a built up area?

We've learned a lot from developing Combat Flight Simulator 2, and we continue to work on performance. We all realize that snazzy new visual effects and detailed cockpits don't mean much if Flight Simulator doesn't run smoothly and reliably. The entire team is focused on performance, and we have a special group of developers and testers who rigorously test each interim build of the product. We're testing and benchmarking performance on a wide variety of systems, and so far the news is very encouraging. If you're familiar with the improvements we made in Combat Flight Simulator 2 even as we added more detailed scenery and visual effects, I'm sure you'll be pleasantly surprised with the performance of Flight Simulator 2002.

Show me the water

PC Pilot: Will any of the Microsoft Flight Simulator series be appearing on X-Box?

We don't have plans to develop Flight Simulator for Xbox. The Xbox console is designed to deliver a set of experiences appropriate for the environment it's designed to work in—the living room—with controllers designed for a console. Flying a sophisticated simulation on a PC is an entirely different experience.

Of course, as new graphics cards and more powerful systems come along, we'll continue to improve the level of detail, special effects, and other aspects of Flight Simulator. We've published the title for some 20 years, and we expect to continue creating new versions far into the future. I think if you look back just a couple of versions, you'll be astonished at how far we've come—and there's no end in sight.

PC Pilot: Amen to that. Thanks for making it happen Bruce!

To keep up to date on Flight Simulator 2002, have a look at the Simflight FS2002 forum at www.simflight.com/news3/news.php ■

Kenji Takeda

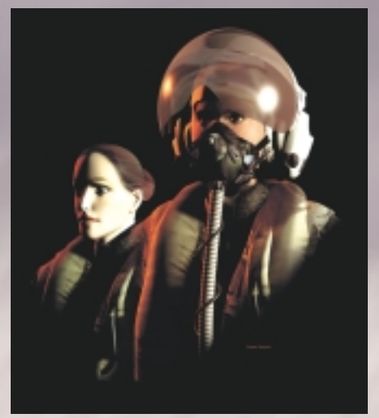
Trees, yep we got trees

Eurofighter Typhoon

Future Perfect

It's been a while since we've been breaking the sound barrier here at PC Pilot. The last batch of fast jet sims included Flanker 2.0, Janes' F/A-18 and its wingman from Digital Integration. But they all seem so… twentieth century nowadays.

Eurofighter Typhoon is the aircraft that will take the RAF well into the new Millennium and who better to bring out the official sim than Digital Image Design (DID). The team from Warrington that were behind the original EF2000, and more recently Total Air War, is perhaps the most respected in the business. Even the Ministry of Defence has turned to them in the past to produce simulations for Her Majesty's armed forces. With such a veritable heritage, BAE Systems and Eurofighter International, makers of the real aircraft, had no qualms in working closely with DID to make sure that this sim is as authentic as possible.



Here, the word 'authentic' doesn't mean hard to fly. As you'd expect in a 21st century jet, the onboard computers take care of checklists and mundane tasks.

The supplied keyboard template is unusual in that much of it is blank. The EFT cockpit is almost devoid of dials, instead consisting of three colour MFDs (multi-function displays) providing all the information you could wish for. Gone is any form of 2D cockpit panel display, here you have the choice of a virtual 3D view or up to three small MFD windows at the bottom of the screen. The Insert, Home and PgUp keys let you instantly switch the displays on and off, with the Delete, End and PgDn keys allowing you to effortlessly change their function.

Purists may scoff, but the idea is to convey the pilot experience, rather than blindly reproducing every rivet. The dials in the 3D cockpit work, but the MFDs don't. In the thick of combat the MFD overlays are far more practical, though. DID made this design decision at the outset and it seems to have been a sound one. After all, you can only do so much on a 17-inch monitor display. We've spoken to both BAE Systems and RAF test pilots on the subject and they've been amazed at the level of authenticity found in the game. Reducing pilot workload is a principal design driver in all modern aircraft, making them easier to fly than ever. One test pilot told us: "in an ideal world, combat aircraft would only need three buttons – 'Go' 'Stop' and 'Kill' – our pilots have to make decisions quickly and they don't want to be struggling with the intricacies of flying a really complex aircraft." So, it seems that flight sims don't have to be complicated

Sleek, sophisticated and a joy to fly

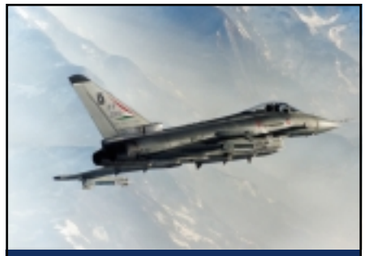
Smile, you're on candid camera!

to be authentic any more. Our flight in the real Eurofighter International cockpit demonstrator at Farnborough 2000 reinforces this point, it was a doddle, far easier than Jane's F/A-18 or Falcon 4.0.

In EFT we found that maintaining a full-screen Heads-Up Display view with two MFD overlay windows gave us great situational awareness. It may be a far cry from the180 degree wraparound display of a full-size simulator, but the minimal on-screen clutter makes for an absorbing experience. In combat the padlock view is invaluable and has enough visual cues, such as glass reflections and cockpit structure, to stay oriented at all times.

That's just as well, as even on the easiest of the three difficulty settings the enemy has some sharp pilots. But the Eurofighter Typhoon is no slouch in a dogfight and handles with plenty of flair. Its unstable aerodynamics mean that it's always tugging at the leash, ready to flip over and jump on the tail of an adversary given half a chance. The fly-by-wire control system means the pilot flies the onboard computer, rather than the plane. This allows for *carefree handling*, where the pilot does not have to worry about overstressing the airframe or stalling the aircraft. The sim models this well, making it extremely forgiving and easy to fly. Above all, you can concentrate on the mission at hand and having a blast. Additional in-flight help and training missions help to make the learning curve surprisingly short for novices too.

At the heart of EFT is the Iceland campaign. Set in 2015 your band of six crack pilots must stave off an invasion force and stand their ground, or the war in Europe could fail disastrously. First you must pick your six men and women, all of whom have different flying and survival



I'LL TAKE 232

The Eurofighter Typhoon is sure to be a common sight in our skies, with the RAF buying 232, 180 for Germany, 121 for Italy and 87 for Spain. And what a sight. For more details of the real aircraft, check out the official website at www.eurofighter.com

Two Eurojet EJ200 turbofan engines	60kN dry thrust, 90kN with reheat (each)
Max speed	Mach 2.0
g limits	+9/-3
Wing span	10.95m
Length	15.96m
Height	5.28m
Wing area	50.0 m2
Basic mass empty	10,995kg
Max take-off mass	23,000kg
External stores stations	13

Your mission, should you choose to accept it...

skills. Then you are transported into the campaign, and the mess where your pilot's play pool and read the paper while waiting to be scrambled. EFT uses a real-time campaign engine that is actually semi-dynamic. There is a storyline, but your success affects the course of the war. The missions themselves are fully dynamic however, providing a varied mix of anti-shipping, interdiction, close air support, combat air patrol and other tasks. There are a few surprises down the line that we won't spoil here, just to say that they seriously spice up the campaign and make your life far from easy.

When one of your team is needed, or by moving the mouse to the bottom part of the screen, the Pilot Bar slides in from below. There's an icon for each pilot and clicking on one transports you to their position at anytime, be it at the base, in the air or in hospital. Crew are first briefed on mission objectives before the planning stage where you can change waypoints and weapons loadouts. Then it's up, up and away, assuming that events haven't taken a turn and your mission has been scratched.

With the campaign taking place on and around Iceland you're never too far away

Nice shelves

Slightly larger than the average 'detached garage'

Scramble, scramble, scramble, bandits inbound

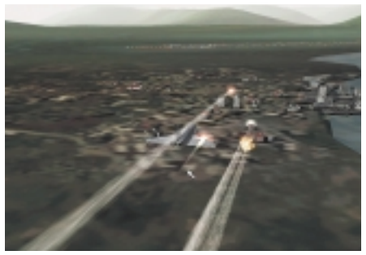
Reach for the skies

Head up folks, it's party-time

Wham!...

Bam!...

Don't forget to check EBC News for the word on the street



On target!

Thank you... Captain!

from the action. Sometimes you fly solo, but usually your wingman is there and if you're lucky, Wild Weasel and Escort flights may be in support too. Hitting the TAB key brings up a Comms menu letting you easily communicate with your units to change formation, designate targets or give them weapons clearance. Half a dozen voices are used to allow you to distinguish who is who on the radio, although at times there is so much radio traffic that it's hard to tell what's going on.

For the novice or trigger-happy flyer, the dynamic campaign may seem slow at times. The peacetime missions work well for training, but the action takes a while to ramp up. Only being able to accelerate time by a factor of two means that there can be periods when no missions are in progress. This does depend how conservative you are in stationing your pilots near the front line. Too far away and they don't get involved, too close and they risk being captured if the enemy take over your airbase. It's up to you to transfer your crew as you see fit, but be careful as you only have six lives. Luckily, you can still keep tabs on other action using the Smart Cam, and you should probably enjoy the lull before the storm

Light the blue touch paper...

Mess with the MiG-29 at your peril

I haven't seen one of those before!

Where did they all come from? And what are they?

Carefree handling, pulling maximum g's without ripping your wings off

No smoke without fire!

as things certainly hot up plenty. For a quick fix you can play the Multiplayer Co-operative missions on your own against some fearsome computer opponents, although these are not customisable. Once your up to it, there are duel, team and Co-op multiplayer options, including both dogfighting and ground attack missions.

The 3Dream graphics engine, first seen in DID's real-time strategy game Wargasm, provides a rolling backdrop of snow-capped mountains and deep river valleys. The terrain isn't fantastically detailed, but most of the aircraft look spookily photo-realistic. The cloud layers work well, but even in 32-bit mode there was some colour-banding that is distracting. However, you're in for a silky ride on even a modest machine. Our 300MHz Celeron with 128MB RAM and a Geforce MX card happily ran at 800x600 (32-bit) mode with full-screen anti-aliasing enabled. Overclocking our CPU to 450MHz allowed us to crank the resolution up to 1024x768 for a spectacular experience. There's no jerkiness at all, and the Smart Cam director's views make for some very watchable footage. Leave the room for five minutes and when you come back you could be forgiven for thinking that your PC had been retuned to the Discovery Wings Channel.

As you can tell, we were mightily impressed by Eurofighter Typhoon, although there are a few flaws. So why did we give it the full Five Star treatment? Because ever since we received an early

A little help from your friends is always welcome

Not exactly a 'soft underbelly'

The Harrier is armed to the teeth

Splashing bandits has never been easier

The devil is in the detail

Uh-oh, time to switch to another pilot

Help me, I'm drowning

Beta copy last year we've been unable to tear ourselves away from it. Even while writing this we've sneaked off behind the stick for a few more missions, ostensibly to check out some detail or other. EFT is the only flight sim, along with Microsoft Flight Simulator 2000 and Combat Flight Simulator 2, that has stayed on our overcrowded hard drive over the last six months.

DID has been brave in trying to strike the balance between realism and gameplay – and they've succeeded admirably. Quite simply, this is the most enjoyable fast jet sim ever.

Kenji Takeda

How voo yoo doo?

If your current graphics card is from 3dfx then there's a chance you may get problems with Eurofighter Typhoon. As 3dfx are no more, it was looking as if a fix was going to be unlikely. However, as we went to press we heard that Rage have got EFT working with 3dfx card, so by the time you read this a patch should be available.

REVIEW SCORE:			
Publisher:	Rage	**Price:**	£29.99
Developer:	DID	**Release Date:**	Out Now
Website:			www.rage.com

At a glance: A fast jet sim that combines realism and action beautifully. The semi-dynamic campaign provides plenty of variety, with missions generated on the fly. An all-round great game heralding in the next generation of fast jet sims. In a word, fun.

SYSTEM REQUIREMENTS: PII 266, 64Mb RAM, 3D graphics card
RECOMMENDED: PII 350, 128Mb RAM, 16Mb 3D graphics card

AUDIENCE WITH THE DON

Here at PC Pilot we've been following the progress of Eurofighter Typhoon eagerly since we first test flew it at Farnborough 2000. To get the lowdown we took on Don Whiteford, DID's Top Gun, with some aerial and verbal dogfighting at the official London launch. And yes, we smoked his tail plenty...

PC Pilot - *How does the design of Eurofighter Typhoon compare with your last title, Total Air War?*

Don Whiteford - Total Air War was a study of modern air combat systems, AWACS, JSTARS etcetera working with a new fifth generation fighter, the F-22. It was academic in its outlook - Typhoon is about drama and technology saving you and the allies from the dark hordes. Losing a pilot in TAW was just a number, in Typhoon it's personal.

PC Pilot - *How much interaction have you had with the Eurofighter aircraft team?*

Don Whiteford - We have had extensive contact with the team; it was they who pulled us away from the pure representation of technology and steered us towards the philosophy of the aeroplane: the plane works for the pilot, allows air-to-air and air-to-ground roles in one mission, then gets the pilot home safely.

PC Pilot - *How much more realistic is the game because of this?*

Don Whiteford -Typhoon is very representative of the way the plane is used, although it doesn't necessarily give you access to a plethora of buttons and switches. In the original Eurofighter we had look-down MFD's with loads of buttons to press. In reality, the MFDs are not used individually this way. Several displays are scanned constantly by the pilot to build up situational awareness. From a purely representational standpoint, we have abstracted the systems, but the net result is far closer to the way the systems will be used in heat of battle.

PC Pilot - *Do you think EFT is as complex as a flight sim should be?*

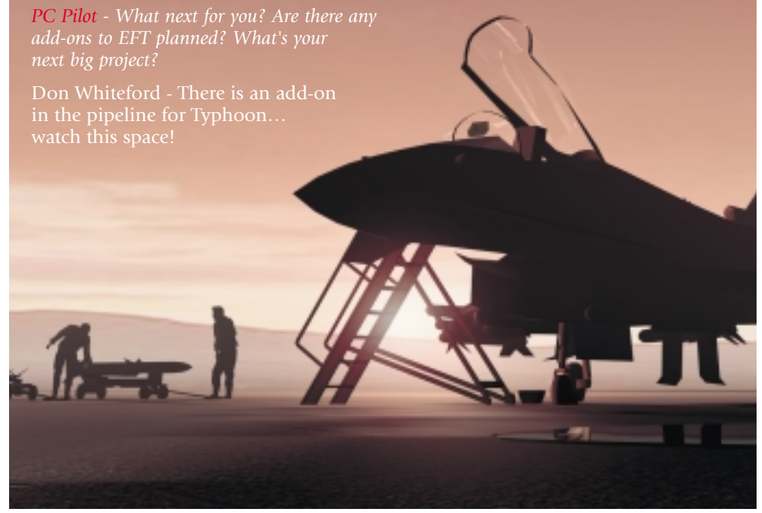
Don Whiteford - Should a flight sim be complex? If it's the flight deck of a Boeing 747, then yes. When you are focused on a fighter designed to reduce pilot workload, and on making a game that is absorbing, exciting and rewarding for anyone who would like to try it, then no. Sophisticated maybe, and Typhoon is very sophisticated with over a million lines of code. Many will remember products like Sierra's Aces Series and Microprose's F-117. These were games first and foremost, featuring aeroplanes. They helped establish the genre, which has become more about the aeroplane than the game. Typhoon is as complex as it needs to be to achieve its goal of enabling anyone to fly a fast jet and get a kick out of modern air combat.

PC Pilot - *What's your view on the future of the flight simulation genre? Is it bright, or will Microsoft clean up?*

Don Whiteford - There are thousands of sim fans out there, and more on the way. The genre will continue, but will undergo fundamental changes in the way that products are developed and delivered to the market. Microsoft offers one way. There will be others.

PC Pilot - *What next for you? Are there any add-ons to EFT planned? What's your next big project?*

Don Whiteford - There is an add-on in the pipeline for Typhoon… watch this space!



ATC Simulator 2000

Are you any good at juggling?

There's no doubt that air traffic controllers are a breed apart. Anyone who is happy to juggle aircraft across a crowded sky with all the inherent implications for people's lives is a person you have to admire. Most of us who enjoy realism with our flight simming, are content to confine ATC to a reassuring chatter in the background from FS Traffic, maybe get interactive with SATCO, or dabble with the excellent ATC in X-Plane. With this in mind, the prospective customers for an ATC simulation where you have to do the difficult bit would appear to be somewhat limited. However, the long-awaited (it was in our news section over a year ago) release of ATC Simulator 2000, a relatively unique product in this genre, would indicate otherwise.

ATC Simulator 2000 Air Traffic Control is the work of Aerosoft, but not the company that brought us the German Airports series and utilities like Flightsim Commander. This Aerosoft is part of PC Aviator Inc., an American company that publishes, among other things, Computer Pilot Magazine.

The main difference between Aerosoft's ATC Simulator 2000 and other similar products is the addition of the Microsoft speech recognition technology that allows you to use voice control when contacting aircraft in your sector. The same applies to the calls made to your centre by aircraft arriving and departing, where the voice calls allow for a much quicker response than a string of text appearing on your screen. Although in this case the generic text to speech engine produces a rather robotic sounding voice.

Your tour of duty begins with the setup screen where you can choose your initial scenario from the 47 sectors provided. (Incidentally the authors have other sector disks available, although at the time of writing they only cover the USA). This menu also establishes whether you will be an approach or departure controller, or both, sets the current time, weather and operating mode, i.e. keyboard or voice control. At this point your Arts-111a ATC terminal is off, waiting for your shift to begin. A quick flick of the power switch brings it to life, displaying an almost perfect replica of the original amber ATC radarscope, complete with knobs and switches around the perimeter that control the various display functions. For example the video gain (intensity) of the onscreen data can be varied, allowing you to concentrate on one particular sector. You can also change the range, centre position and update speed of the radarscope itself.

As the activity begins you can call up conventional flight strips showing each aircraft's call sign, current heading and altitude. The strips are updated each time a new altitude or heading is assigned, helping you to keep track of the aircraft under your control.

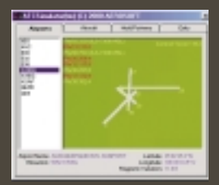
You can choose from dozens of facilities... this one is rather busy

The amount of time and frequency between aircraft movements will depend on the sector you originally chose. Naturally, you would be well advised to try your hand at one of the quieter airfields first, controlling just a couple of aircraft at a time.

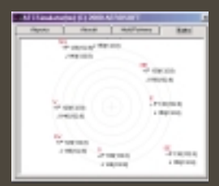
Pop-up and see me some time!

The pop-up information panel provides you with all the information you need for your current assigment

The aircraft that are assigned



A schematic of the runway systems



The standard departure routes

Stack 'em up in the holding pattern!

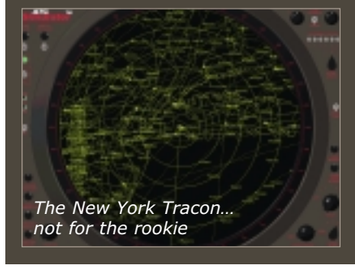
On track with TRACON

What is a TRACON? Well, it stands for Terminal Radar Approach CONtrol facility and it's the part of the complex ATC system that's concerned with sequencing aircraft into and out of major airports where the traffic volume requires one for safe passage of aircraft.

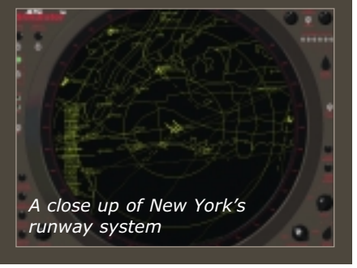
There are two types of TRACON controllers:

- The Departure Controller accepts hand-offs from the tower after an aircraft has departed and safely vectors and guides them away from the airport to the point where they commence the enroute phase of their flight. It is at this point that he hands them over to Centre Control.

- The Approach Controller accepts aircraft that are descending inbound to the airport and have been handed over by Centre Control. The Approach Controller must then keep them safely separated by distance and altitude, issue radar vectors and get them lined up for final approach, where he hands them over to the tower.



The New York Tracon... not for the rookie



A close up of New York's runway system

Because some of the larger fields like Chicago O'Hare for example can handle anything up to 153 aircraft an hour, which for the inexperienced controller can be, shall we say…interesting!

The authors have based the traffic in ATC Simulator on real-world situations, so the number of movements and aircraft types for any particular airport will be typical for that field. Also, the runways and frequencies used will depend on the prevailing weather conditions.

Most of the commands you issue are in the form of a shorthand, so if you want to tell an aircraft to "climb and maintain 12,000 MSL" then "contact centre on 132.8", you would type 'Ctrl' (every command starts with Ctrl) CM space 120 space CC space 132.8 return. The pilot will then read back your instructions and follow them, but not blindly. This form of communication is surprisingly quick once you become familiar with the commands.

In case you haven't already worked it out, the purpose of the simulation is to steer the aircraft under your control, either to or from the relevant airport, while at the same time making sure they don't bump into each other (or anything else for that matter). The program monitors your progress, producing a detailed report at the end of each session to determine if you are due for a promotion, or relegated to the bats, (marshalling aircraft on the ground). To give you some idea of the (ahem!) difficulty, one of our crack test team was fired after his first training session, mainly for not providing the outbound aircraft with an enroute altitude. Although come to think of it, two aircraft did mysteriously disappear off the radar screen and we've no idea why!

In practice, the program works very well, providing an authentic simulation that after a couple of hours can become very absorbing. You get quite a buzz after successfully controlling half a dozen aircraft all the way to touchdown. Unfortunately, this sense of euphoria is fairly short lived, because just when you think you've sorted them all out, a few more aircraft appear for you to juggle with.

Sadly the voice control is not quite so realistic and although we tried it on two different systems we didn't get much success. Which is a bit disappointing, because it would make the simulation far more natural to use. To be fair the authors were quick to respond to our problems but admitted having mixed reports from their users. Some found the speech recognition very easy to set-up and use, while others like us were somewhat frustrated with little or no response from the recognition engine. Our own Managing Editor's suggestion that regional accents were confusing the software was treated with the contempt it deserved! In fact, we found the keyboard shortcuts actually quicker to use and far less hassle.

Overall, this should be a fascinating package for anyone that fancies trying his or her hand at 'pushing tin'. However, it has all the hallmarks of something released in a hurry and the fact that the patch for it (on the Issue 10 cover CD) solves some installation problems, suggests a lack of testing. It shows great promise and we can only hope that an upgrade is in the pipeline. ■

Joe Lavery

Pushing tin for real

Everyone knows that apart from running a flight sim magazine, air traffic control is the most stressful profession in the world. Is it really possible to replicate the trials, tribulations and stress of ATC in a computer simulation? We spoke to Dalibor Jovanovic, who works as an ATCO (RDR/APP & TWR instructor) at Ljubljana in Slovenia, and asked him what he thought about the feasibility of simulating the work of an air traffic controller. He told us:

"The basics of ATC haven't changed much from the early days. New technologies just help us to cope with the volume of traffic, which is constantly increasing, especially in the vicinity of major airports. There are only a handful of ATC simulators available to the general public, so I warmly welcome ATC Simulator from PC Aviator. People have said it's expensive, but its price tag has got a lot less numbers than a real ATC simulator! Working on a TRACON position is extremely demanding and US airports are among the busiest in the world. In terms of technology, today's TRACONs are not as young as they used to be, so to speak.

With an ATC simulation that will run on a PC, now everybody has a unique opportunity to try our job for themselves. They must try not to breach any of the regulations that make flying safe, while at the same time ensuring that they keep delays to minimum. A fine balance between the two is the essence of our work."

Air Traffic Control at Ljubljana in Slovenia

REVIEW SCORE:			
Publisher:	PC Aviator Inc	**Price:**	£54.95
Developer:	Aerosoft	**Release Date:**	Out Now
Website:		www.pcaviator.com/atc2000	

At a glance: Has the potential to be fantastic, but at more than fifty quid the bugs are unacceptable. Great fun if it was about half the price and currently only covers the USA.

SYSTEM REQUIREMENTS: PII 300, 64Mb RAM, sound card

RECOMMENDED: PIII 500+, 128Mb RAM, headset microphone (for speech recognition)

Flight Deck II

That's an awfully small ship

You are number one... call-the-ball

The number of letters we get each month from readers who have trouble installing freeware would indicate that getting the files into the right directories and properly registered is not such a straightforward task. Consequently, you'd think that the publishers of commercial products would provide installation routines to automate the process... wouldn't you?

Coming in for a 'controlled crash' on the USS Nimitz

Well you'd be wrong because the latest release from Abacus includes a quick-start guide that boldly proclaims "Read This First" and then goes on to explain about the auto-run function provided on the CD and the setup.exe that you should click if you happen to have auto-run disabled. Well, it really doesn't matter which you choose because the auto-run file doesn't exist and if you click on the first setup.exe you find, you'll be presented with a runtime error. However a little more investigation produced another .exe file in the D:_AbacusInstallations\AbacusFlightDeckII\Cd_fs2000\ directory, which is nestling three directories down. There is a different installation for users of Combat Flight Simulator II and it's worth noting that this add-on isn't compatible with the original Combat Flight Simulator.

The interior detail is up to the mark

Anyway, having got that gripe off our chest, we're happy to report that once you get it installed, Flight Deck II is rather good. The six aircraft in the package are well designed with no signs of the chunky exteriors we are normally quick to criticise. Likewise, the textures that breathe life into the models are crisp, beautifully painted with an attention to detail that is not often surpassed and fully rounded fuselages

The 'Mule' - nicely detailed but no good for a drive in the country

complete the picture. But more important than all this visual delight are the flight models, which are tweaked to give a true rendition of the original aircraft. The panels do not reach the same level of detail we've come to expect, but they are adequate for products like Flight Deck, which are really designed to give you a flavour of carrier borne operations.

To complete this collection of six fast jets and reconnaissance aircraft, you get the USS Nimitz to land upon and a selection of missions that place you firmly in the firing line. Either lined up ready for that enormous thump in the back on takeoff, or just about to call-the-ball as you approach the back of what appear to be a very small aircraft carrier. You ought to know that a carrier landing is affectionately known in the trade, as a controlled crash.

Scanning the horizon from inside the Hornet – no sign of Goose!

It takes 40,000 lbs of thrust to get an F-14 Tomcat airborne

It's hard to believe the Tomcat first flew over 30 years ago

Maverick requesting a flyby

Missed the wire, so full afterburners for the go around

Under normal circumstances taking off or landing on an aircraft carrier in Flight Simulator is practically impossible because you can't build up enough speed for takeoff before you roll off the deck and you can't slow down quick enough when you land. So the authors of Flight Deck have added a few tweaks to help you, in the form of special keystrokes that give you a quick boost on takeoff and act as a very effective brake as you hit the deck.

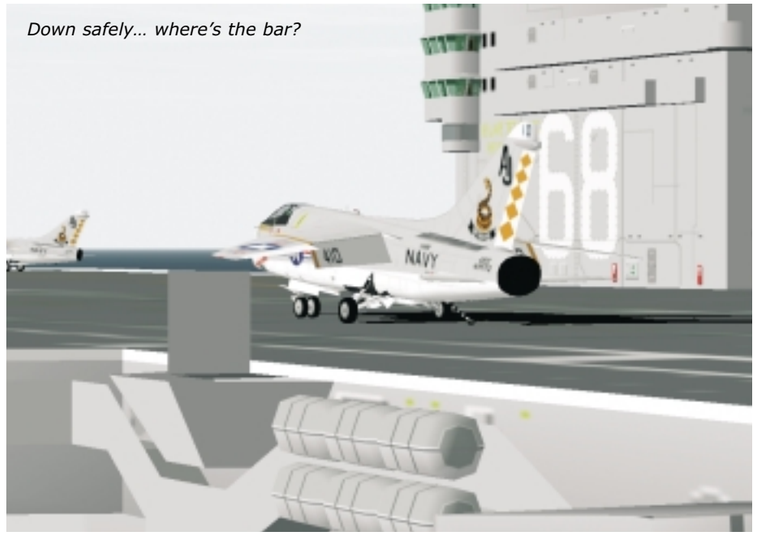
They have even provided you with an aircraft tow truck called the Mule to drive if you fancy something a little different, although the deck of the aircraft carrier Nimitz makes your sphere of exploration rather limited!

The selection of aircraft is quite wide and ranges from the 1950s Skyhawk (that only retired in 1987) to the F/A-18 Hornet that is still in use today. As well as the fast jets that you'd expect in a carrier-based expansion, there's also the Grumman E-2C Hawkeye, a turboprop design with its distinctive 24ft wide radar dish.

Other than the installation hiccup Flight Deck II is still a worthwhile addition to your collection. ■

Joe Lavery

Down safely... where's the bar?



The deck can get busy!

REVIEW SCORE:

Publisher:	Abacus	**Price:**	£24.99
Developer:	Abacus	**Release Date:**	Out Now
Website:	www.abacuspub.com		

At a glance: A beautifully detailed opportunity to try your hand at the most difficult sphere of operations in the world of flight - carrier takeoff and landing. The package is marred by an installation glitch, but once overcome it's great!

SYSTEM REQUIREMENTS: PII 500, 128Mb RAM, 3D graphics card

RECOMMENDED: PIII or Athelon 800+, 133 MHz Bus, 256Mb RAM, 32Mb 3D graphics card

Korean Combat Pilot

Dogfighting on the 38th Parallel

The Korean Conflict (which apparently can't be called a 'war' since there was no formal declaration of such, even though it seemed very much like a war to those who participated) has also been called 'The Forgotten War' because of its relative obscurity, overshadowed by the Vietnam War. The Korean action was very significant for aircraft development because it was the first test under warfare conditions for the early jets, as well as the last generation of propeller-driven fighter airframes.

There have been a few simulations on the market that have addressed this era. Virgin Interactive released Sabre Ace several years ago, but it was roundly ignored by flight simmers. Empire's MiG Alley, on the other hand, was a terrific simulation for many reasons, although winning all the scenarios and campaigns was well nigh impossible. Microprose's Falcon 4.0 primary campaign was also set in Korea,

Bombing on the parallel

but the complexity of the sim made this a tough nut. Which brings us to Just Flight's Korean Combat Pilot, addressing the same era but using the Combat Flight Simulator and Combat Flight Simulator 2 engines as a base.

The changes made by Korean Combat Pilot to these engines are subtle but noticeable. They fall into two categories. The first is the better terrain. Mesh terrain scenery is used to reproduce the Korean landscape and provide a more realistic view out the cockpit window. The change in terrain rendering is good but not dramatic, although it does allow better ground-based missions. The area of modelled terrain is wide, covering the entire land areas of North and South Korea as well as offshore islands and sea from Sushima in the south up to the Yula River and Chinese border. (The famous attacks on bridges over the Yula are included as a mission.)

Russian tourists causing havoc

The Shooting Star jet closes quickly on an enemy. The slower propeller-driven aircraft has no chance against the faster F-80

The animation upgrade is easier to spot when looking around through the cockpit glass and from exterior views. Pilots in planes move their heads, a subtle but interesting effect that adds a little life to the units. The control surfaces of all the planes are also animated, so you can see the flaps, ailerons, elevators, air brakes and rudder all move (in the proper direction) for changes in attitude.

Aircraft are all painted properly, and the markings match those in the reference books. There are even wear and tear effects on the planes, showing up as weathering and oil stains as appropriate.

The main focus of Korean Combat Pilot is, of course, the Korean peninsula and the air-based combat that occurred there. Korean Combat Pilot's plane retinue is impressive. Propeller-heads will find a few piston-powered units available, especially at the dawn of the Korean Conflict. The Fairey Firefly served as a reconnaissance fighter with several forces (the model depicted in Korean Combat Pilot is from the Royal Australian Navy) and can be carrier landed. The arresting hook is animated and looks great. The Royal Navy's Hawker Sea Fury also has an arresting hook, and while it served primarily for ground support, it did participate in a few MiG showdowns. For the US forces, the Chance Vought F4U-5N Corsair, which was showing its age in Korea, allows you to fly the familiar inverted gull-wing onto a carrier.

This B29 has just been jumped by four bandits after a bombing mission against a Yula River bridge

But we made it back...

The focus for most simulation fans will be the newer jets, which are well represented. As the Korean Conflict was brewing, a number of new fighters were added to the USAF's arsenal. The F-86F Sabre was the first swept wing jet and was used by many countries through the 1950s and 1960s.

The simulation of the F-86F includes the airbrakes, which can be extended and retracted (with accompanying animations). Grumman's F9F-5 Panther (with arresting hook for carrier landings) is in the flight line, and the damage modelling shows how well this plane managed to stay in the air and make it to the carrier even when badly shot up.

From the bomber perspective, there's a Boeing B- 29 Superfortress, a lumbering four-engine monstrosity that handles as well as a concrete mixer in the air and in total contrast, there's a Bell H-13B Sioux helicopter (the famous MASH helicopter).

Rockets away!

The other side of the Conflict is also represented with Illyushin Il-10 Sturnovik, MiG 15, and Yakolev Yak-9. The Yak-9 and Il-10 are propeller driven, and for a while at the start of the Korean Conflict the Yak-9 dominated the skies. The MiG-15 was a capable plane, but the lack of advances as the Korean campaign dragged on allowed the US to gain the advantage with faster, more capable jets.

The cockpits of all the planes are very well modelled, and comparison with photos shows the accuracy of Just Flight's interiors. In all cases, one particular unit that participated in Korea has been chosen to represent each plane, except for the MiG 15, which has three different liveries. There are several pop-up panels available in most planes, and these can be moved about the screen to suit your needs. The basic panel, though, is fixed in place.

If you plan to use the enhanced Korean Combat Pilot graphics boosted to their maximum, you'll need at least a 400MHz Pentium. For slower machines, you can step the graphics down a notch or two. All of the usual Combat Flight Simulator/Combat Flight Simulator 2 sliders work to allow you to tailor the Korean Combat Pilot settings for your machine. A warning for Combat Flight Simulator 2 users: the Combat Flight Simulator 2 engine allows only 98 aircraft to be in the database, so you may have to uninstall some add-ins to reduce the number of aircraft appropriately. This limitation doesn't exist with Combat Flight Simulator.

The campaigns and missions are a strong point with Korean Combat Pilot. There are two major campaigns and twenty missions. There are six starting locations for the missions or campaigns. Three are ships (the US aircraft carriers USS Essex and USS Leyte) and the HMS Unicorn. The carriers (and their support ships) are superbly rendered and detailed, providing takeoff or landing platforms for carrier ops. With the animated tailhook on carrier-compatible aircraft, there's the challenge of not only winning a mission but also returning safely to land on the carrier.

The missions are divided into British, North Korean, and US. For the most part, they are interesting and have varying degrees of challenge. Some missions seemed too easy, but those that require every ounce of skill you can muster balance them. Unlike MiG Alley, all the missions are winnable with a little practice and a touch of luck.

Damage modelling in Korean Combat Pilot is accurate. Some planes, such as the Panther, were famous for making it back with extreme damage. Other planes were not so lucky, and suffered catastrophic failure after only a few hits. The modelling is different for each plane, and tailored to represent reality as much as the designers could discern.

The flight models are as good as they can be with the limitations imposed by Combat Flight Simulator 2. Each jet has a slightly different feel, and requires different strategies.

Comparing MiG Alley and Korean Combat Pilot is inevitable as they are the two best simulations of this period. The flight models used in both sims are close, but there are differences. The visual appearance of the planes and scenery in Korean Combat Pilot are better (MiG Alley had an awful lot of non-descript brown terrain), but there are some planes that feel more realistic in MiG Alley.

As the aircraft were probably designed for Combat Flight Simulator, they don't look as good in Combat Flight Simulator 2, nor do they handle as well as they could.

There's a lot to be said for Korean Combat Pilot. It may not be quite as accurate and complete a simulation as MiG Alley, but it is more fun and easier to learn. The stability and quality of the underlying Combat Flight Simulator and Combat Flight Simulator 2 sims are intact, and Korean Combat Pilot adds an extra layer of detail and polish to the visuals in Combat Flight Simulator. More important, though, is that Korean Combat Pilot adds a new dimension to the host programs - not only the jets but also the Korean peninsula. Recommended for anyone just looking to have fun as well as those searching for accurate historical simulations.

Tim Parker

REVIEW SCORE:			
Publisher:	Just Flight	**Price:**	£24.99
Developer:	Blue Arrow	**Release Date:**	Out Now
Website:			www.justflight.com

At a glance: Adds significantly to CFS/CFS2 - good for anyone just looking to have fun as well as those searching for accurate historical simulations. However, flight models and graphics are not up to CFS2 standards.

SYSTEM REQUIREMENTS: PII 300, 64Mb RAM, 8Mb 3D graphics card

RECOMMENDED: PIII 450, 128Mb RAM, 32Mb 3D graphics card

The Falklands conflict from a vertical perspective

Carrier takeoffs are pretty hairy until you get the hang of them

Harrier Jump Jet

Harrier Jump Jet, developed by Alpha Simulations, brings together 17 different Harrier jets from all nations. This is a very flexible add-on and works with Flight Simulator 2000, Combat Flight Simulator or Combat Flight Simulator 2, offering a Falklands war scenario, complete with 20 missions where you can fly for the Argentine forces or Royal Navy/RAF.

The Harrier models span the prototype P.1127 through to the latest GR.7 and AV-8B+ and the artwork is impressive, with the exception of some blocky rearward views. The models are fully animated, with pilots in their seats and rotating 3D nozzles. Panels are accurate and quite beautiful for each type.

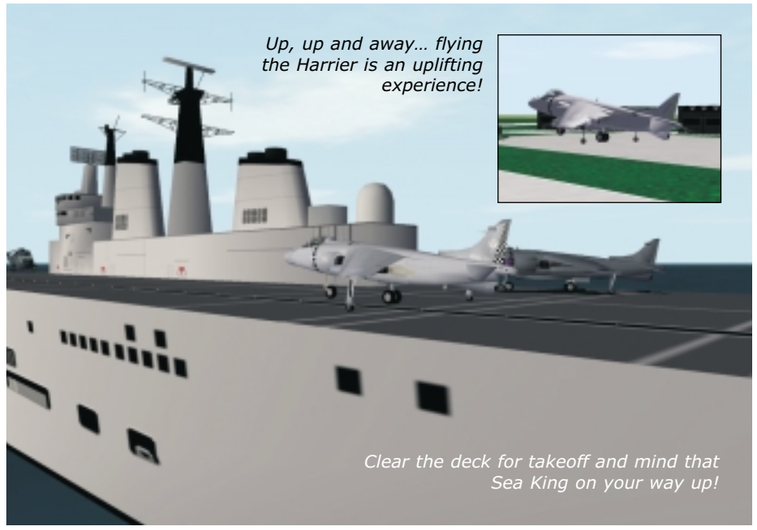
For the Falklands War scenario there is a Sea King helicopter (but no sign of HRH The Duke of York at the controls), four Argentinian aircraft as antagonists, including the A-4Q and A-4P Skyhawks, Mirage Dagger and IA-58 Pucara. There's also a scenery package that includes four airfields, NavAids and an authentic carrier group offshore. The Falklands War theme continues with detailed San Carlos scenery and a multitude of ships are at anchor, including destroyers, frigates, landing support ships, HMS Fearless, SS Canberra and other requisitioned merchant vessels.

While the add-on works with three titles, Combat Flight Simulator 2 is the best place to fly, with its detailed atmosphere effects and wingman commands. The sky over San Carlos is filled with tracer fire and SAM missiles. Static scenery includes battle-damaged aircraft in various states of repair.

The cockpits are different for the Harrier variants

Installation was straightforward and Jump Jet uses up very little disk space. Missions may be accessed singly or via the Campaign dialogue. (Be sure to start your session with the Jump Jet icon, or Combat Flight Simulator will not find the aircraft or missions). However, it's not all "up, up and away" as there some limitations imposed by the Flight Simulator environment (or 'host program' as it's called on the box). Four wingman commands are available but wingmen are only moderately intelligent, possibly because the pilot AI includes awareness of energy state, calibrated for low power prop combat. Some players are not receiving wingman voice response to commands in Combat Flight Simulator 2. Missiles act like unguided rockets, another Microsoft limitation and if you have the Combat key set selected in Combat Flight Simulator II, the keys for some controls will be different from the manual. The flight model feels good, with appropriate energy loss or retention, and redout and blackout are modelled. Engine nozzles can be vectored, allowing a very high rate of turn as well as (almost) vertical/short take off and landing. When not heavily loaded the Harrier will hover, although don't expect to replicate all the tricks that real Harriers perform at airshows.

All the features of Combat Flight Simulator are here, including the tactical map, additional windows, and the enemy indicator. Enemy bases are well defended, and bandits will try to lure you into AAA range. You can set the game difficulty at easy, medium or hard. Since your antagonists are varied, the player has to work at tactics to succeed in the combat arena. The Pucara is a relatively easy



Up, up and away... flying the Harrier is an uplifting experience!

Clear the deck for takeoff and mind that Sea King on your way up!

target, though its slower speed and manoeuvrability will challenge the pilot. Simply as an aircraft, it's actually quite good fun to fly in Flight Simulator 2000. However, as a combat mount, the Mirage is a faster and a more difficult target.

Speaking of targets, the damage effects are somewhat conservative. Pieces will fly off damaged aircraft and explosions are not as dramatic as in some simulations and we couldn't see any holes or burnt metal on the aircraft we shot down. However, the effects are quite satisfying nonetheless.

With resolution at 1024x768 and 32-bit colour, our frame rate was generally low.

There's a Harrier closing in on this Puccara – the meeting may prove fatal

One down, one to go... 1980s meets 1950s and wins

However, 16-bit colour looks almost as good, with the exception of the skies and improves performance significantly. We've heard that some other reviews have described the overall look of Jump jet as 'dark'. It's hard to pinpoint any specific problem and anyone who has been to the South Atlantic will tell you that it's a pretty overcast place for most of the year! This may be a graphics card issue, but suffice it to say that everything seemed to look as it should when we flew around The Falklands.

Authentic sound-sets are included for the jets and the Sea King, though to get the best out of sound you must fly in Flight Simulator 2000 or Combat Flight Simulator 2. Mission flow is nicely done, and the level of challenge seems to increase.

Whether you fly in the original Combat Flight Simulator or Combat Flight Simulator 2, the Harriers will still lack radar and missiles, but the close-in fighting is great fun and enemy bases are nicely detailed. Overall, the Harrier experience is a tough challenge for any flight simulator and we think that Just Flight have succeeded in overcoming it and provided an entertaining expansion that should interest combat fans and those seeking something very different to throw around the sky. ■

Leonard Hjalmarson

REVIEW SCORE:			
Publisher:	Just Flight	**Price:**	£24.99
Developer:	Alpha Simulations	**Release Date:**	Out Now
Website:			www.justflight.com

At a glance: Special attention to mission flow and historical scenarios give life to the Harrier. Falklands campaign includes 20 missions, plus you can fly for Argentina. Lacks wingman control in Combat Flight Simulator.

SYSTEM REQUIREMENTS: PII 300, 64Mb RAM, 8Mb 3D graphics card

RECOMMENDED: PIII 450, 128Mb RAM, 16Mb 3D graphics card

The Falklands War

Argentina had claimed sovereignty over the Falkland Islands (known to them as The Malvinas) since the early 19th century, but Britain had occupied and administered the islands since 1833 and consistently rejected Argentina's claims. In early 1982, with a new military government facing great economic pressures, Argentina launched a military invasion of the islands on 2nd April, overcoming the small garrison of British marines. By late April Argentina had more than 10,000 troops stationed on the Falklands.

In response, the British government under Prime Minister Margaret Thatcher declared a war zone for 200 miles (320 km) around the Falklands and assembled a naval task force with which to retake the islands.

On 2nd May the Argentine cruiser General Belgrano was sunk by a British submarine inside the war zone, but debate has raged ever since that as the Belgrano was steaming away from the islands, this was an unnecessary attack. Attempts by both the United Nations and the United States to mediate the crisis proved unsuccessful, although in Britain the US 'mediation' was seen by the press as a lack of support from a traditional ally. Argentine air attacks sank two British destroyers and two frigates but failed to prevent the British from making an amphibious landing near Port San Carlos on 21st May. From this beachhead British infantry advanced southward to capture the settlements of Darwin and Goose Green, turning eastward to surround the Falklands' capital of Stanley on 31st May. The Argentine garrison surrendered on 14th June, ending the conflict. The British reoccupied the nearby South Sandwich Islands on 20th June.

Britain captured about 10,000 Argentine prisoners during the war, all of whom were afterwards released. Argentina sustained about 700 men killed, while Britain lost nearly 250. Argentina's defeat discredited the military government under General Galtieri and led to the restoration of civilian rule in that country in 1983.

The Falkland Islands – traditional home of seals and sheep, but not the Argentinian army

YOUR VERY OWN FLIGHT SIMULATOR

Frustrated with your flight simulator? Why not write one yourself - Stephen Heyworth did!

Ready for take off in your own flight simulator

Have you ever found that no matter how many flight simulators you try, there are some features that are absolutely vital to you, but are missing from all of them? Do you get frustrated with some common features in your flight simulators, such as the impossibility of trimmed level flight? Or perhaps you are an ace programmer and just fancy having a go at writing a flight simulator. You may think this is the preserve of multi-million pound development teams, but PC Pilot writer Stephen Heyworth did just that. All the screenshots used to illustrate this feature are from his own simulator and he provides a solid introduction about how you could set about writing one too. Even if you think you never will, understanding a bit more about how simulators work may help you recognise why some things are written the way they are.

Get started with the basic tools

To write a flight simulator you will need to have a tool bag with a few basic skills in it. There are not too many of them but they are absolutely vital if you want to produce anything that is even half respectable.

As anyone knows who flies a simulator, the absolute killer for enjoyment is a poor refresh rate. This is usually quantified as the number of frames per second. If the refresh rate is too slow, the simulation takes on the characteristic of a slide show. Unless the frame rates are fast enough, the simulator is somewhere between extremely annoying and intolerable. Therefore, the first two tools you will need are concerned with getting a fast refresh rate of at least 20 frames per second at all times.

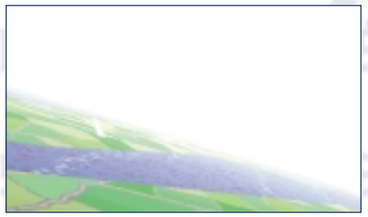
Tool One is the programming language and it must be a language that produces the fastest possible programme from a reasonable amount of effort. Unless you are writing a very simple flight simulator, the current versions of BASIC will produce programmes that run far too slowly. At the other extreme, Assembler, or Machine Code, can potentially produce the fastest flight simulator, but it will take you forever to write and debug. The only sensible choices for your flight simulator are really C and C++. The modern trend is towards C++ because of its object oriented design and the ease of interfacing it with all the library functions you will use. C++ is a relatively simple language with a complex set of library functions that will manage most things from file handling to matrix manipulation. It is significantly harder to learn than BASIC, but once you have invested the time to get a reasonable grasp of the language and how it interfaces with Windows, it is a logical language that will give you far greater control over your computer. So tool one is the C++ programming language together with the best quality compiler you can afford.

Tool Two is the Graphics Library. Every part of a flight simulator you see on your screen is a form of graphic. The components vary from simple lines, circles and polygons, right the way through to perspective corrected bitmapped polygons. Again, the problem is getting them to appear at high speed. Most programming languages can produce reasonable graphics on your screen, but unfortunately even a modern C++ Windows graphic will be too slow unless you want your simulator to look ten years out of date. Not too long ago, the only way to have the necessary high-speed graphics appearing on your screen was to write all your own graphics routines in Assembler. If you want to try this out, have a look at 'Computer Graphics, Principles and Practice' by Foley, van Dam, Feiner and Hughes. This is one of the best (but heavy going) books for the theory of low-level graphics. However, this is not the recommended approach for your simulator. The better way is to use a standard library of fast graphics functions where someone else has already done all the hard work, and there are two suitable choices. They are Glide and DirectX, and of the two DirectX is likely to be more accessible, and will give more functionality because it also provides control of your sound and joysticks too. Not only can DirectX produce the basic graphics, but it can also handle all your 3D needs if you so wish. The other big advantage of using these libraries is that code written using them will work on most modern computers.

Option setting can be far easier using simple screens than it is using Windows menus

Tool Three is the library you have on your bookshelf. This will need to be extensive and cover everything from programming to the theory of flight, cartography and matrix algebra. There are a few that are absolutely essential. If you choose to go the Microsoft DirectX route, your library should include the Microsoft books 'Inside DirectX' and 'Inside Direct3D'. You will also need some basic C++ texts to get you started and those published by Wrox are normally pretty good. On the aviation side both 'Aerodynamics' by Clancy and 'Mechanics of Flight' by Kermode are both good texts, as is 'The Design of the Aeroplane' by Stinton if you can find a copy. For the working of your instruments, any professional instrument-rating manual should give you the basics of how these things work.

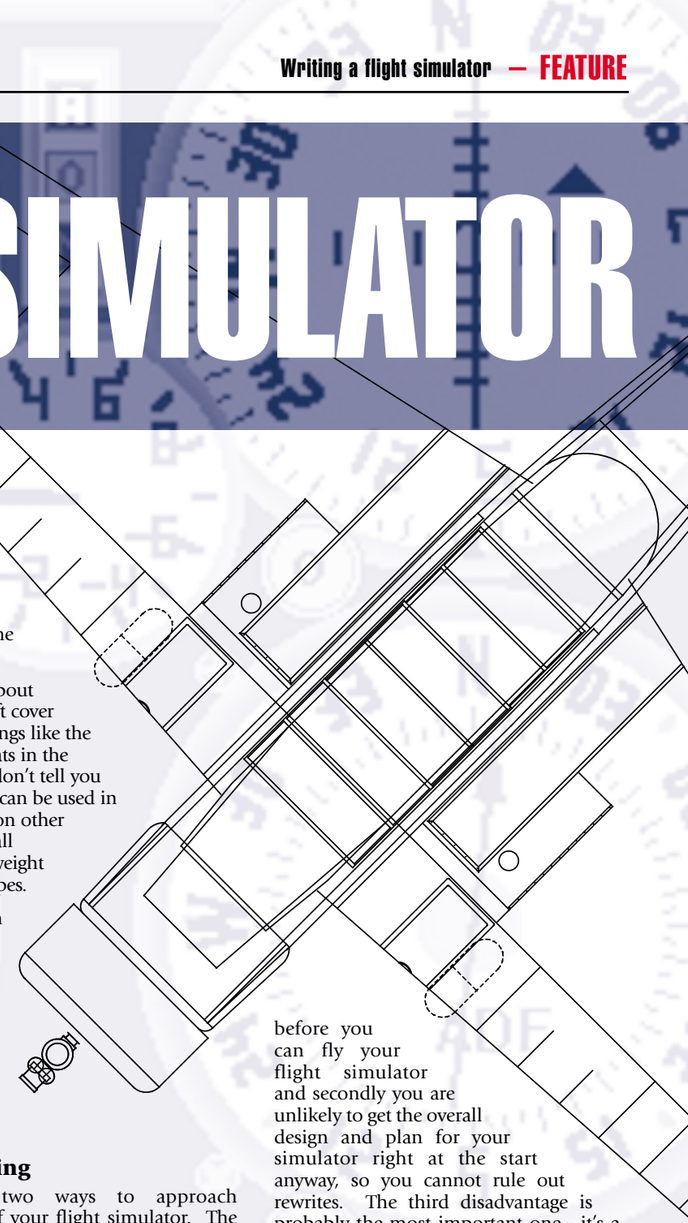
Tool Four is your data box. This includes everything you can find about your chosen aeroplanes and your virtual world. The geographical part can be covered by aviation maps and airfield manuals, which are available for many countries. Finding the data for the aircraft is much more difficult. Colour schemes can be gleaned from several sources, but the flight dynamics are almost impossible to obtain. You will have to resort to searching everywhere and collecting whatever information you can. Some aviation magazines review aircraft from which you may skim some information.



Without fog, the world would have a very sharp edge. Fog adds significantly to the realism of your scenery

Most books about specific aircraft cover interesting things like the number of seats in the fuselage, but don't tell you anything that can be used in your simulation other than the overall dimensions, weight and engine types.

However, with the growth of the Internet, this is probably now the best source.



Get planning

There are two ways to approach production of your flight simulator. The first is the professional and sensible way to do it. Plan everything before you start. Decide exactly what your finished simulator will look like and how it will work, and then work out how you are going to make it happen. Next split your project into a number of manageable separate subtasks. Then do these subtasks and test them one at a time. Finally bring it all your tested elements together on the final day and turn the virtual key on your virtual aeroplane's ignition. There will still be some debugging to do, but it should be minimal because all the individual components have been thoroughly tested already. This is clearly the best way to do it because you will spend relatively little time chasing blind alleys and redesigning everything. It also lends itself to a team approach, where the work is split between a few likeminded people. However, there are three disadvantages to this approach. Firstly it will take an awful lot of work before you can fly your flight simulator and secondly you are unlikely to get the overall design and plan for your simulator right at the start anyway, so you cannot rule out rewrites. The third disadvantage is probably the most important one - it's a bit too much like hard work for something you are doing for fun.

The more enjoyable way to develop your simulator is to begin with something very simple and then add complexity. This means that your first step is to produce an absolutely minimal simulator. Ideally, this would be a basic panel with only the four main instruments, backed up by an unrealistic flight model that responds to keyboard inputs for joystick and throttle. Then everything else you add later is a tweak, which you can try out as soon as it is completed. There are some other benefits here too. Debugging is easier because every addition is small, consequently you know where to test and check. You can have a few weeks off and just fly your simulator for a while. It also creates the possibility of trying out a few ideas before you have written too much code.

Whichever way you choose, do make sure you split your code into separate files. Each file or 'module' should contain a collection of functions that have a sensible association. This means that you will have a module that deals with aerodynamics, one for the instrument panel, one for the radios, one for file handling, one for clouds, one for the engines, and so on. Each file would contain several functions. A function is a piece of programming code that does something, and it is a handy way of splitting your programme down into elements that are easy to understand and use. Typical library functions would open a file, draw a line on the screen, calculate the square root of a number or check for pressed keys. A typical flight simulation function would handle the panel, but would do this by calling other functions to handle the instruments, these in turn would call functions to draw the needles, and these would call yet more functions the in the graphics library. Each function does one thing, and one thing only. Unless you subdivide your programmes like this from the start, your programme will very quickly become unmanageable. If you are a C++ purist, you would subdivide your programmes into Classes, which are collections of data and functions, there are some definite advantages to Classes, but the effect is pretty much the same.

Approaching a home built Barrow in Furness

Overall control

There are several components of a flight simulation programme and you will have to write the functions for each of them. There are, of course, many ways to solve the problems of flight simulation, however most will share the same basic components.

There will be a controlling function, which is usually called 'main' or 'winMain', which does two things. It does all the initialisation and then enters an infinite loop until you close the flight simulator.

During the initialisation phase, the programme will set up DirectX to match your computer and load any files that it is going to need, or at least check that they exist. Things like the radio frequencies, sounds, bitmaps, geography, aircraft characteristics and panels are all loaded and initialised. The more you can do during the initialisation phase, the less you will have to do during the simulation itself, and this increases the refresh rate. Also, holding as much of the data in memory (RAM) as possible means that your simulator will have to access the disk fewer times, which will avoid those horrible stutters during a flight. Unfortunately, for very big programmes you are unlikely to hold everything in RAM and disk access is unavoidable.

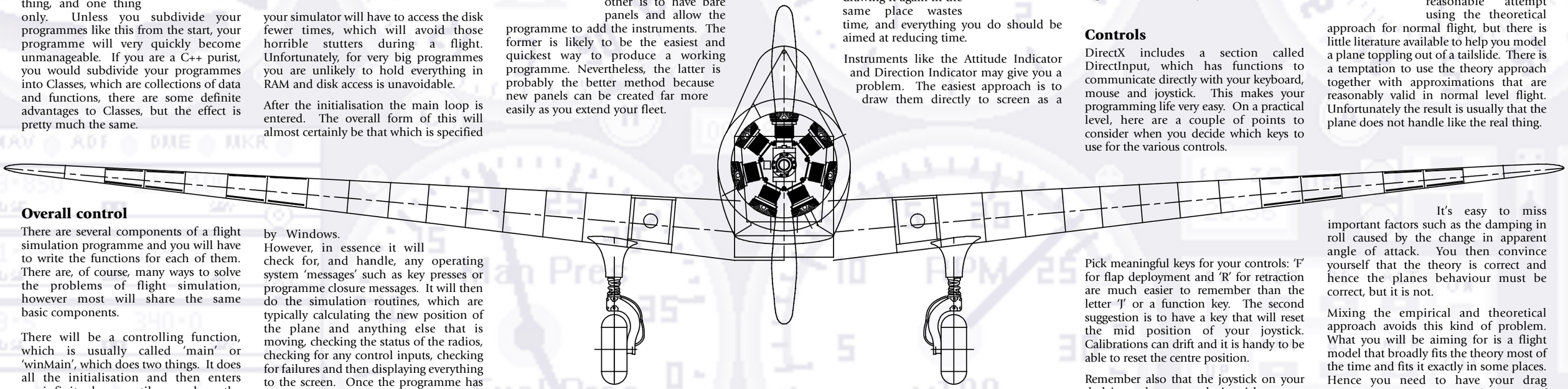
After the initialisation the main loop is entered. The overall form of this will almost certainly be that which is specified by Windows.
However, in essence it will check for, and handle, any operating system 'messages' such as key presses or programme closure messages. It will then do the simulation routines, which are typically calculating the new position of the plane and anything else that is moving, checking the status of the radios, checking for any control inputs, checking for failures and then displaying everything to the screen. Once the programme has done these tasks, it starts the loop again by checking for system messages.

Because the main loop does all its work by calling other functions, it is only about 30 lines long. There is one other thing that needs to be handled at this top level of the programme. When you end your simulation session, it is most important that the programme shuts down gracefully by releasing everything that it has grabbed during initialisation. This will include freeing up the RAM that was reserved for the programme as well as letting other programmes regain access to the keyboard, mouse and screen. Of course, this is all done by a single function call.

There are several other modules that you will need to include in your simulator and what follows is a brief description of the most important ones, together with some key techniques that will make your simulator fly, in more ways than one.

Instrument panels

There are two ways to manage your instrument panels. One is to have panels with all the instruments built into them and the other is to have bare panels and allow the programme to add the instruments. The former is likely to be the easiest and quickest way to produce a working programme. Nevertheless, the latter is probably the better method because new panels can be created far more easily as you extend your fleet.



Early flight simulators used to flicker as the screen was cleared and all the instruments were redrawn. This was minimised by a number of clever techniques, however modern hardware allows a far better system. What appears on your monitor's screen is a portrayal of a bitmap held in video memory. Modern simulators hold two bitmaps in memory. One bitmap is displayed on your monitor while the other is having the next image redrawn on it. Once the drawing is complete, the software 'flips' the two screen so that the newly drawn image is shown and the original one can be redrawn. Again, all this clever trickery is managed by DirectX so long as you give it the correct instructions.

To draw the individual instruments, a technique called 'Bit Blitting' is used. This is a very fast library function used to put a bare instrument onto your panel so that you can draw on the needles in their new position. It's worth checking to see if the needle has moved because drawing it again in the same place wastes time, and everything you do should be aimed at reducing time.

Instruments like the Attitude Indicator and Direction Indicator may give you a problem. The easiest approach is to draw them directly to screen as a multitude of lines or circle sectors, a modern PC's can draw them satisfactorily quickly. Nevertheless, a better way is to create a bitmap of the moving part of the instrument and then rotate and paste the relevant part of the bitmap onto the instrument. Clever use of the functions in the graphics libraries allow you to do this without the hardcore programming of old. These will become standard library routines as the graphics libraries develop.

If you want clear instruments for your ILS, write your own flight simulator and you can have them

Controls

DirectX includes a section called DirectInput, which has functions to communicate directly with your keyboard, mouse and joystick. This makes your programming life very easy. On a practical level, here are a couple of points to consider when you decide which keys to use for the various controls.

Pick meaningful keys for your controls: 'F' for flap deployment and 'R' for retraction are much easier to remember than the letter 'J' or a function key. The second suggestion is to have a key that will reset the mid position of your joystick. Calibrations can drift and it is handy to be able to reset the centre position.

Remember also that the joystick on your desk is not the same as the joystick on most aeroplanes. Unless you have something special, your joystick's centre position is always in the same place. When you trim a real aircraft the centre position changes forwards and backwards. You hold the joystick where you need it to be, and then change the trim until the joystick stays put when you let go. As your joystick is unlikely to be able to do this, you need to artificially programme something that feels correct. This is not easy to do, which is why so many commercial programmes end up with a system that feels totally wrong and is unstable.

Flying

There is yet another choice to be made here. You can spend hours and hours developin a theoretical model for your flight simulator, or you can spend hours and hours empirically developing some routines that make the plane feel right. The best results are somewhere in the middle because the physics of flight are so complex there are few people (if any) that can properly model every characteristic of an aeroplane. It is possible to make a reasonable attempt using the theoretical approach for normal flight, but there is little literature available to help you model a plane toppling out of a tailslide. There is a temptation to use the theory approach together with approximations that are reasonably valid in normal level flight. Unfortunately the result is usually that the plane does not handle like the real thing.

It's easy to miss important factors such as the damping in roll caused by the change in apparent angle of attack. You then convince yourself that the theory is correct and hence the planes behaviour must be correct, but it is not.

Mixing the empirical and theoretical approach avoids this kind of problem. What you will be aiming for is a flight model that broadly fits the theory most of the time and fits it exactly in some places. Hence you need to have your drag increasing in proportion to the square of the speed. You also need to have both

your drag and your stall speed increasing with angle of attack. The relationship need not match the exact characteristic of the plane you are modelling so long as the top speed and stall speeds are correct and the overall feel of the plane is correct. In most circumstances, it doesn't really matter that the simulator throttle is 60% open when the real plane's is 70% open. Consideration of the following factors should help you to design your plane to fly like the real thing.

- The drag at maximum speed equals the engine thrust, although take care with jets, where thrust is rarely the limiting factor.
- The speed for the maximum climb rate at sea level is dictated by the weight, drag and thrust.
- There should be enough power to overshoot from the landing flare.
- Most wings stall at an angel of attack of 16 degrees.
- Test fly the planes on your simulators to see how they perform

In each loop of the programme, your plane will move a little. The new position of the plane in each loop is calculated by knowing the linear velocities (speed in all three directions) and angular velocities (rotation about all three axes) of the plane and the time of the loop. The distance moved can be calculated using:

NewPosition = OldPosition + Velocity x TimeOfLoop

And

NewAngle = OldAngle + AngularVelocity x TimeOfLoop

Simple? Well no. For big heavy planes this is probably all right because they have a lot of inertia and things don't change much over a fraction of a second. However, for a small plane like a Pitts Special, things happen far too quickly for this approach. What is required here is to split the time for each loop into a number of shorter time chunks. So if your loop time is a twentieth of asecond, you could perform 100 flight separate calculations at one two-thousandth of a second.

3D Polygon Mesh terrain in the Lake District.
It is far more realistic than the older 'flat earth' system

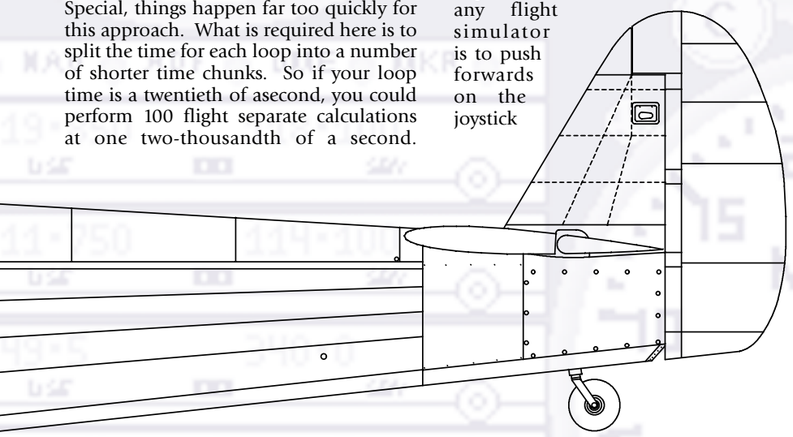
Because the flight model calculations are fast by comparison to displaying the graphics, the improved accuracy comes with little penalty to the frame rate. This method will be adequate for most simulations, but if you want even more accuracy you could do some curve fitting to ensure there are no instabilities creeping in. With modern fast computers, this last step is likely to be of little real benefit.

If you go for the mixed approach, the bare minimum of equations you will need are:

Acceleration = Mass / Force

NewSpeed = OldSpeed + Acceleration x TimeOfLoop

A good test for any flight simulator is to push forwards on the joystick and dive vertically downwards. Next, roll through 90 degrees and pull out of the dive. You should now be flying on a new heading that is 90 degrees from your original heading. What has happened is that your rolling manoeuvre has actually changed your heading and not affected your angle of roll. Many older (and some not so old) simulators either cannot smoothly execute this manoeuvre or completely fail the test. The key to realistic freedom in all dimensions is to use quaternion mathematics. This is a parametric way of representing the orientation of a plane. Without quaternion you will have problems handling the relationship between roll and direction when flying close to the vertical.



Engines, power and thrust

Unless you are simulating a glider of some description, you will need to model the engine types fitted to your plane. Getting your hands on power plant data for real aircraft is not easy, but you will be able to find the maximum power or thrust produced. Jet engine thrust can be used directly because the thrust is simply the accelerating force on the plane. Piston engines are much harder to simulate, however all aero piston engines will have similar characteristics, with minor modifications for turbo-charging and gearboxes. Hence if you can find data for one engine, you can then scale it for others based on their peak power. Propellers, whether connected to piston or turbine engines, are much harder to model. Initially this does not seem too bad, because there is a fundamental relationship between power, thrust and speed.

Thrust = Power x Efficiency / Speed (in consistent units)

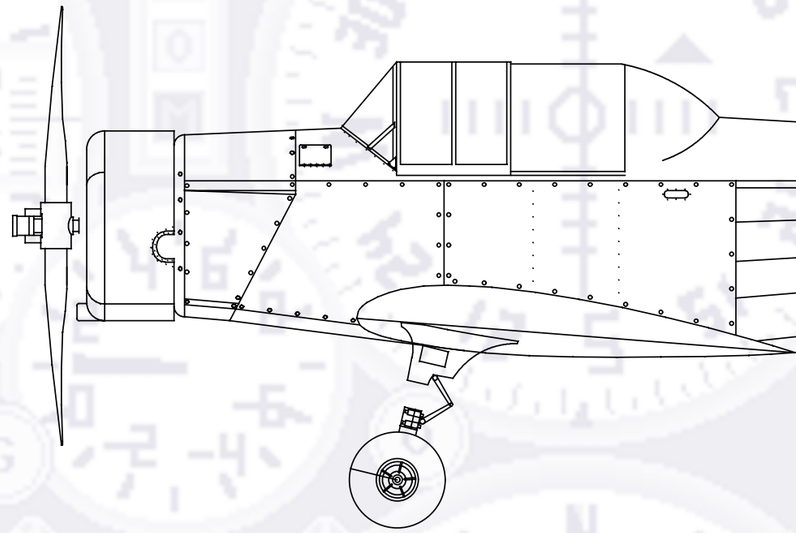
Unfortunately, using this calculation will leave you in a mess. As you wait to take off at the end of the runway at zero speed, the theory suggests that the engine produces infinite thrust, which is clearly nonsense. The conundrum is caused by the fact that the power is applied to the air and not to the plane. Even when the plane is stationary, the air is being blown back past the plane and the 'speed' is not zero. The force on the plane is given by the area of the propeller disk times the pressure difference across it, however the overall calculation is quite involved. You could find all the necessary analysis in literature about propeller theory, but this is one of the areas where an empirical approach combined with an understanding of the factors involved will give you a reasonable result, and is likely to be the best in the long run.

3D Geography

There are two types of terrain models used in flight simulators, the old flat earth and the modern 3D mesh types. The older simulators have a world that is in two parts: a flat surface; and objects placed on the flat surface, such as hills and buildings. Modern simulators have constantly varying topography with long ridges and winding valleys. This is achieved by creating the world out of a series of points all linked by a three-dimensional wire-frame mesh.

Because there are libraries like Direct3D that handle everything to do with 3D mesh imagery, the mesh approach is far easier nowadays. What's more, Direct3D will paint your favourite bitmap of fields, towns and lakes across the mesh to give you an instant realistic landscape. If you use Direct3D, be certain to use Immediate Mode with its DrawPrimative methods and not Retained Mode, otherwise you will pay a big penalty in frame rate. Also consider doing your own 3D transformations. Direct3D will do them for you, but if you have trouble with frame rates, you may find that you can get better speeds by doing your own transformations and depth sorting, leaving the Direct3D library to do the final 'rendering' onto your screen in perspective corrected 3D.

However you choose portray your world, it is important to manipulate and draw as little of your world as possible. Working on anything that is not going to appear on your screen is a waste of time. The visibility in the UK is rarely more than 20 miles, so drawing things beyond this distance is not realistic and will reduce your frame rates dramatically. Hence you need to check what could be visible and reject (or clip) everything else before you even think about transforming or drawing it. You will need to be careful that your world doesn't stop at an unrealistic straight line when the visibility is low. Using 'fog', so that things your landscape slowly disappears into the haze, is the most realistic way to achieve this.



Transformation of the scene is relatively straight forward, but you will need to use some simple matrix algebra. The key to speed here it to pre-multiply matrices for roll, pitch and direction to form one transformation matrix. You will also need to apply the matrices in that specific order for things to work properly. The techniques for these transformations are explained in most 3D Graphics texts as they are fundamental to the subject.

Ancillary activities

You will need a few extra file and functions to cover things like file handling, sound management and your menu structure. File handling is straightforward, however sound is best handled using a combination of DirectX and a standard library called 'mmsystem'. Remember when using any of these library functions, you only need to be able to use them and you don't need to understand any details about how they work. For your menu system, unless you take pleasure in developing Windows menus, you may find it easier and faster to create a full screen page with clickable buttons to set your options.

Support programmes

Depending on how you plan your flight simulator project, you may have to write a host of support programmes. These are best created as C++ windows programmes. You will probably find them easy to write compared to a flight simulator, if only because there are hosts of texts about how to do it. Typical support programmes would be terrain mesh design programmes, airfield design programmes, aircraft design programmes, panel design programmes and nav/com radio data manipulation programmes.

Three greens, gear down

Once you have something working, there is immense satisfaction in dropping your undercarriage and landing on your own airfield for the first time. The big bonus is that you can have a simulator that is exactly as you want it. When things annoy you in it, you can change them. Everything is under your own control and you won't have to wait for the next release of a commercial simulator, only to find out that the niggling problems are still there.

Unless you are a genius or able to spend your whole life developing your simulator (or your name is Austin Meyer), don't expect to be up and flying in a month or two having completed something that looks as good as the commercial simulators. The big companies have teams of people working on their products, each with their own skills. They employ programmers, artists, aviation experts and so on. What you can do is make your simulator excel in the areas that are important to you and spend far less time on aspects that are of little interest. For example, if you don't want a flashy start up screen, simply leave it out. If you want your co-pilot to talk to you, put it in.

If you decide to try writing your own programme, start simple and grow your flight simulator in the same way you would eat an elephant, a bit at a time. This analogy is a good one too, because to develop your 'all singing and dancing' flight simulator will take about the same amount of time, and it will be an experience you will never forget. ■

Stephen Heyworth

Do-It-Yourself, Canadian Style

Editing Navaids in Flight Simulator 2000

Have you ever wondered how you could add or edit navigation aids (ILS, VOR & NDB) in Microsoft Flight Simulator 2000 without being a programmer or scenery designer?

We found ourselves pondering that question recently when we discovered that several navigation aids, in this case, NDBs (non-directional beacons) were not included in the default scenery of some of our favourite areas of British Columbia, Canada. Initially, we thought that we were doing something wrong when flying into Victoria International Airport and tuning Mill Bay NDB several times but to no avail. We opened the flight planner portion of the program and noticed that Mill Bay was incorrectly listed as an intersection and not a NDB. One thing led to another and before too long we had determined that three other nearby NDBs were also missing from the program.

This is where our dilemma started because without access to a programmer or a scenery designer there didn't seem much that typical flight simmers could do about this problem. However, we guessed that there were already some pretty clever people out there who had invented the wheel long before us, so we decided to search some Internet sites to see who might have already done something similar. It did not take very long to find several downloads of missing navaids for Flight Simulator 2000. The main thing we learned was what to start looking for within Flight Simulator 2000. The author of one download included a readme.txt file that told us we needed to find some type of scenery ndb.bgl file. Armed with this new information we slipped our Flight Simulator 2000 CD into the computer and began to explore it. We found no less than 49 ndb.bgl files on the

VANCOUVER/VICTORIA CLASS C AIRSPACE FOR FLIGHTS AT AND BELOW 12,500' MSL SEE VANCOUVER VTA CHART
WHITE ROCK
ACTIVE PASS
CTAF in vicinity of the San Juan Islands is 128.75 MHz
EAST SOUND
VICTORIA
FRIDAY HARBOR
CTAF in vicinity of the San Juan Islands is 128.25 MHz
VICTORIA HARBOUR (WATER)
SMITH ISLAND
CTC WHIDBEY APP WITHIN 20 NM ON 118.2 286.0
EDZ HOOK
PORT ANGELES RCO

A Canadian chart showing the NDB that started us off!

Approaching Victoria, British Columbia

disc. Not really understanding what a bgl file was, we decided it was time to get serious and take a trip over to the Flight Simulator 2000 web site, where we found a SDK (software development kit) and downloaded the Scenery_SDK.zip file.

Upon unzipping the file we found the kit contained several tools for image editing and uncompressing and compressing bgl scenery files. It also had an Adobe Acrobat document that was very technical and we were ready to quit right there but fortunately we didn't, because the document actually helped us to understand how scenery files are structured.

The compression and decompression utilities were included because the scenery files are compressed to save disc space but in order to modify a scenery file you first have to uncompress it with one tool and then after editing it you have to compress it back into the program with another tool. Unfortunately the tools are designed for programmers who understand MS-DOS programming language and as we mentioned earlier, those in the team with programming skills were making themselves scarce.

This is where Herve Sors of the Prevair Group came to the rescue. Herve has developed two tools that allow non-programmers to work with a simple GUI (graphical user interface) in order to add, edit or delete ILS, VOR and NDB information found within Flight Simulator 2000. He also has similar tools for FS95 and FS98 but we want to limit our discussions to his Flight Simulator 2000 utilities.

The first tool is called FS 2000 Microsoft BGLZIP Windows Interface v1.00 and can be downloaded from Herve's web site at www.prevair.com The file name is zbgl.zip and downloads in a few seconds.

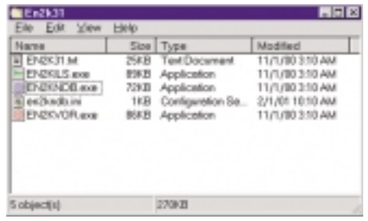

En2k31
File Edit View Help
Name Size Type Modified
EN2K31.txt 25KB Text Document 11/1/80 3:10 AM
EN2KILS.exe 89KB Application 11/1/80 3:10 AM
EN2KNDB.exe 72KB Application 11/1/80 3:10 AM
en2kvdb.ini 1KB Configuration Se... 2/1/01 10:10 AM
EN2KVOR.exe 86KB Application 11/1/80 3:10 AM
5 object(s) 270KB

Figure 1 - Herve Sors' handy zbgl utility

What this tool does for the flight simmer is provide the familiar Windows interface which can be easily followed to uncompress those bgl files found in the program. Figure 1 shows how the interface can be used locate a ndb bgl file on your hard drive or CD then uncompress it and have it sent to a directory of your choice for editing. This same tool will be used to reverse the process by compressing the edited file and sending it back into the program.

That brings us to Herve's second tool for editing called EASYNAVS 2000 - Flight Simulator 2000 ILS,VOR and NDB EDITORS, Version 3.1. This utility is actually three utilities in one package as the name implies, one for VOR, another for ILS and the third for NDB as shown in Figure 2.

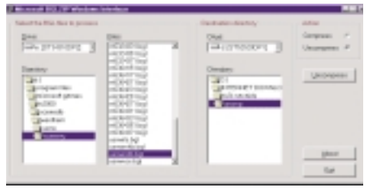


Figure 2 – Herve's ILS, VOR and NDB editor

We're just going to use the NDB editor but the other two are used in a similar manner. The EN2K31.txt file is important to read because Herve has outlined how the navigation aids are set up in Flight Simulator 2000. He includes plenty of detail for programmers and scenery designers but the beauty of his tools are that you don't have to be either to use them. Figure 3 shows the NDB editor with the drop down menu ready to extract the uncompressed ndb. bgl file information.

After extracting the data base the next interface appears as shown below.

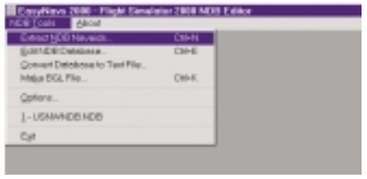


Figure 3 – The NDB editor with drop down menu

Using the 'Make database' button on the right side of the interface creates a new file which you can use to add, edit or delete the navigation aids that are shown.

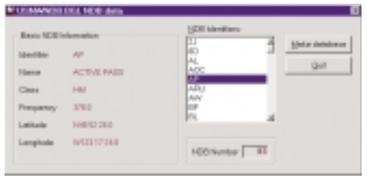


Figure 4 – Our next interface

In this case, we added the Mill Bay NDB to the database using the 'Edit NDB database' selection from the drop down menu of Figure 3.

Figure 5 shows the interface with its easy to follow format for editing, adding or if you feel the need, deleting NDB navaids.

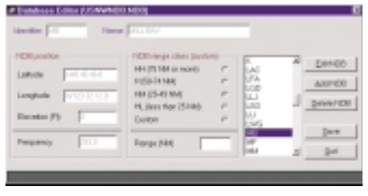


Figure 5 – use this interface to edit, add or delete NDBs

The editor allows you to select an Identifier, Name, Position, Elevation, Frequency and determine what range you would like to assign to the navaid. Position defaults to a standard Microsoft Flight Simulator 2000 decimal display but again referring back to the drop down menu of Figure 3 you'll see the 'Options' selection.

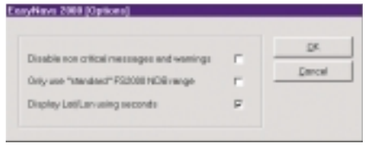


Figure 6 - Three options are available

When opened, it reveals the three options shown in Figure 6. Since we were new to Herve's program we elected not to disable any warnings or messages. An advanced user might find it beneficial but at this stage we felt we needed all the help Herve could offer. We also elected not to use the 'Standard' NDB class range because we wanted to experiment with different ranges to see how they would show up on the aircraft instrument panel when flying in Flight Simulator 2000. The third option, however, we found to be extremely useful if you plan to use ACS-GPS or another global position system instrument in your cockpit because they are normally displayed in seconds and it will allow you to enter the same coordinates into Herve's editor without having to convert seconds to decimals. Simply check the appropriate box and click 'OK' and you are on your way.

Well, we were able to find our navaid bgl file, uncompress it and edit it with the help of Herve's tools. But what happens now? An important point to remember is that the new database file that the utility creates for editing is not in the bgl format any longer and you must convert it back to a bgl file. Sounds difficult but once again Herve has made life easy for us. Simply select the 'Make BGL File' from the drop down menu and the edited database file will be converted back to a scenery ndbbgl file.

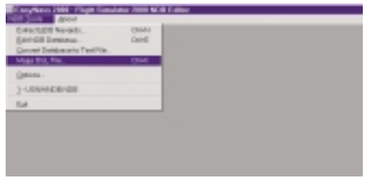


Figure 7 - Selecting 'Make BGL'

Now it is time to compress the newly edited ndb.bgl file so that we can send it back from whence it came. Using the first tool again, Microsoft BGLZIP Windows Interface, we simply reverse course and compress the edited file and direct it back into the scenery folder of Flight Simulator 2000.

Figure 8 - Selecting the file

Turning on our ILS final

A beautiful sunset over Victoria

The new ndb.bgl file is now up and running and ready to be flight tested in Flight Simulator 2000. It is also important to understand that only the particular instrument on the aircraft panel will be updated and not the Flight Planner portion of Flight Simulator 2000. Microsoft did not release any SDK (Software Development Kit) for the Flight Planner so don't expect to see your newly created navaid proudly displayed in it.

Some astute readers might have noticed in the last figure that we were actually editing the usnwndb.bgl file which is the Northwest United States NDB file instead of a Canadian NDB file. This is because the Microsoft programmers elected to place it there and it did initially create a problem for us when we started looking for it. Our hunch is that the certain navaid bgl files were organised from US Low Altitude Enroute Instrument charts which in this case does include the Vancouver and Victoria areas of Canada.

The lesson learned, however, is to search the adjoining geographic areas if you do not find the correct navaids listed.

We feel that we now have a much better understanding about the inner workings of Flight Simulator 2000 as a result of this exercise, not to mention a more accurate database, which makes our flight experiences more enjoyable. It was gratifying to be able to actually correct a programming problem without being a programmer and for that we have to give credit to Herve Sors' great utilities. ■

Frank Grindel

Dedicated to Design

From sheet metal to scenery – a profile of Gary Summons

Gary Summons at work

Elsewhere in this issue we've taken a look at the work involved in programming your own flight simulator, flight modelling and also our experiences of editing navaids. The picture wouldn't be complete without a look at scenery design, so Chris Jarman grabbed his palmtop and put a few questions to top scenery designer, Gary Summons.

Gary Summons is now established as one of the most energetic UK scenery designers for Flight Simulator 2000. How has a 34-year-old one-time sheet metal worker, managed to become such an expert in this field? The answer is, of course, intelligence, very hard work and superior dedication. When Portsmouth-born Gary first tried out a flight simulator, on the old Atari ST in 1989, he never envisaged giving up his day job, and eventually becoming a full-time scenery designer on the PC.

Gary began teaching himself to program with an early Sinclair ZX81 and soon graduated to hacking into the Atari machine code for sheer interest and changed some of the Heneda Airport scenery in the flight sim. He then wrote a complete 3D perspective game, which was never published, as the Atari had rather faded out by then. A couple of years later he acquired a PC and started to use the free 'Airport' program making simple objects.

Five years ago Gary bought 'Airport and Scenery Design' by Abacus and began to try his hand at making complete airports

Inside the Europier at Heathrow

The Bae System factory at Filton for servicing A300 aircraft

Main terminal at Southampton Airport

Guernsey Island and its airport

such as Exeter, Southampton and of course his local field, Bournemouth where he now lives. It was the encouraging feedback from users of this first scenery that made him see the possibility of becoming a full-time designer. He decided then and there to take on the challenge of designing every UK airfield.

Years as an aircraft 'spotter' helped Gary to find his way around airfields, and so now instead of photographing aircraft he began concentrating on the idiosyncrasies of the buildings. Airfield security sometimes takes a dim view of this, but with a number of friends in Air Traffic Control he persevered and made his first serious scenery for FS98 of the Channel Islands. Using the SCAM code created by Manfred Moldenhauer, he developed his own manual system to produce the terrain mesh.

Gary's strong belief is that scenery design is 50% coding and 50% research. To be a good and successful designer you must put time and effort into finding accurate source material, and to visit at first-hand the places you are making. For UK2000 Parts 2 and 3 he took over 2000 photos and 7 hours of video footage. He drove by car to visit all of the 50 airfields involved. He also mentions the great help he was given by users who sent in their own photos as well, which proved to be very valuable to the project. Gary says he gets pretty annoyed with designers who think they just need to look at a chart to make scenery!

Gary released his first three sets of UK scenery as shareware. His innovations are many and quite outshine the commercial scenery on offer. His brick wall or blanket across some airfields are clever ways to cripple demo scenes without offence (or even 'a fence' – pardon the pun). He has Mike the Marshaller in several airfields, sheep that have to be moved, grazing on runways and quite amazing lighting effects at night. He has also written very full and illustrated onscreen manuals to accompany the scenery, another innovation, which could usefully be copied by the bigger firms. Many designers use 'generic' objects from pre-provided programs for their buildings. Gary makes each object by manual coding as accurately as possible, especially ensuring that old and asymmetric buildings are copied faithfully.

His latest project has been the modelling of Heathrow. It took about 1,000 hours to research and code for Flight Simulator 2000. It was made entirely by hand without the help of any design program. Paint Shop Pro v7 is his standard graphics platform for creating textures, trees, centrelines and roads.

For UK2000 Part 4 he will have to depart from the shareware format, because it will be around 25Mb in size. He can't envisage anyone downloading a file that large just to see if they like it. As a result, a demo will be released first and the main scenery will be obtainable as a CD. See you all at the front of the queue! ■

Christopher Jarman

Next Year's Model

Does the real one fly like that?

We are all familiar with the hype surrounding much of the flight simulation world - "as real as it gets!" "tested by real pilots!" "you'll believe you're really there!" The unfortunate truth is that most aircraft are nowhere near "as real as it gets". Despite the marketing slogans, we normally end up with unrealistic flight dynamics, control response more applicable to an arcade game than a flight simulator and a flight model that has clearly never been introduced to concepts such as mass and inertia. To quote from one developer, when a pilot queried the handling of a particular aircraft "*Uncontrollable? that is crap. And I'm not sure how we as non-pilots are supposed to know exactly how these things handled? If by some miracle we got it spot-on, who would know? The man's an idiot, ex-pilot or not. Please don't send me this kind of rubbish.*" Good to see customer service is still alive and well amongst simmers!

Fortunately for those of us looking for a more realistic experience, there are a small number of other people in the flight sim community who work hard at redefining flight models so that they are a more accurate simulation of how a real-world aircraft behaves. Foremost amongst this group is Rob Young from Cornwall.

Rob (PPL and glider pilot) first became involved with changing flight parameters after the initial release of Fly! Although most aspects of the programme were (and still are) superb, the aircraft were far too sensitive and 'twitchy'. Rob, together with Basil Copeland, approached Terminal Reality and were finally given the go-ahead to work with Paul Russell, Fly!'s lead flight modelling programmer to revise the Skyhawk flight model. The revised flight model was included in the first patch release, and declared a huge improvement.

Rob maintains that the internal mathematical structure of Fly!'s flight modelling system is the best available under about a million pounds – it just needs to be fed the correct information! With this in mind he, together with Peter Sidoli, a talented corporate prop and jet pilot and a very experienced simulator user, systematically began working on the flight dynamics of every aircraft that comes with Fly! This was to be no 'weekend' project – it took three months just to get the Skyhawk to side-slip properly!

The Lear L35A – flying (almost) exactly as the makers intended

Remember – an accurate flight model means a more challenging flight!

They modelled the precise rotate speeds, angles, yaw/roll coupling, inertia, suspension, prop drag and lift, cruise speeds, stalls, spins – everything that needed to be incorporated in order to provide a true-to-life flight experience. Anybody who hasn't tried one of these revised flight models is in for a very pleasant surprise – gone is the overly sensitive aircraft and in it's place is something that actually feels like it is carrying a substantial amount of mass and inertia that doesn't really want to deviate from the straight and level.

We asked Rob how he sets about working on a flight model, and his answer makes interesting reading:

"The way Peter and I work is as follows:- I start with a 'default' canvas, with two wings, tail-plane, rudder and fuselage. I discard the engine, slew the aircraft up to a few thousand feet, glide around and first get the pitch feel right. The pitch control is absolutely fundamental to a flight model. By pitch control I do not mean just how long it takes to get from straight and level to 20 degrees nose-up, but the resistance to the air mass, the inertia, the speed of pitch change, the smoothness and the stability to hold that pitch. Then gradually I refine the other controls, add side slip, get the roll/yaw coupling right, the drag, lift and lateral stability. Then I add the engine and send a 'coarse' model to Peter. Inevitably he will fly it for three minutes and come back with a list of about 10 items, some of which have made me think "oh my God - I am totally incompetent" - but that's what's needed to get things right.

"Next we concentrate on take off. Over and over again until she rotates exactly on target and then we look at climb and cruise climb. This is very important to get correct, as any flaws here will reflect later in all sorts of scenarios. Next, we do stall and spin tests, even on an aircraft not 'cleared' for spinning. If a model refuses to spin, then there are bound to be basic flaws in the whole flight model which stop it from spinning. By the way, Flight Simulator 2000 aircraft cannot spin, they can only spiral dive. Fly! aircraft spin (almost) properly partly because you can model extreme asymmetry in wing behaviour in certain scenarios, eg: one wing is stalled and the other is less so. Real spinning motion is very complex. Fly! is not perfect in this regard, however and there are flaws, mainly concerning the inability to spin 'flat', which can only be achieved by completely throwing other normal flight characteristics.

"At this point we deal with approach profiles. Here we follow the aircraft manual to the letter, getting the speeds, drag, flaps, gear drag, descent rate, and power settings as exact as we can. Then we'll shoot many approaches in different weather, winds, turbulence, cloud until we are happy. Lastly, I personally do about fifty separate flights from airport to airport, tweaking as I go, (thank heavens for windowed mode) getting the autopilot tuned and fine-tuning drag, engine and other stuff.

"Finally I spend a few days taxiing around and getting the suspension as close as possible to what I imagine it would be like in the real world version."

Rob Young's flight model for this HS-125 is far closer to reality than anything else around

The HS-125 Dominie T.1 appears in the livery of RAF Training Command

By this time Rob was also working on the appearance of the aircraft, adding window lighting features and some changes to the instrument panels. And so the V88s series of aircraft came into being, representing what is probably the best collection of aircraft available for Fly! Rob estimates that the V88s collection took something in the region of 3,000 man-hours to develop, which is amazing when you consider that the end result of that labour is then given away as freeware. One of our personal favourites has been the HS125 Dominie T.1, resplendent in the red and white colour scheme that used to grace all RAF Training Command aircraft.

However, it has just been knocked off it's pinnacle by the release of the beautiful Lear 35A. This aircraft looks absolutely superb, really capturing the grace and lines of the original. Unfortunately, we have no experience of the real thing (!), but it handles exactly the way that you would expect an aircraft designed by a bunch of guys who designed fighters for a living to do. Light, responsive, and very smooth.

Not content with improving the lot of Fly! fans, Rob has also turned his attention to Flight Simulator 2000 and his re-worked Mooney and King Air 350 flight models should be on the hard disk of every 'serious' flight sim enthusiast.

For anybody reading this who is wondering what all the fuss is about and "what's wrong with the default models anyway?" then we suggest that you download some of Rob's work and try it. Be warned though! You can't handle these things the way that you can with the default aircraft – they respond as a real world aircraft does and if you don't pay attention to what you are doing then they will bite. It is now possible to experience accurate stalls and incipient spins – either of which can ruin your whole day if you happen to be on short finals at the time! However, the feeling of satisfaction from 'greasing' a landing in an aircraft that responds accurately all the way round the circuit is difficult to beat.

Finally, the ultimate proof of Rob's work came when he was invited to be a part of the development team for Fly!II – Terminal Reality obviously know a good thing when they come across it!

Rob's work may be found at the usual sites, or on his own web-site at http://website.lineone.net/~r.young. To date, total downloads of Rob's work exceed 110,000 – that's a lot of satisfied flight-simmers! A visit to Rob's own site is well worth undertaking, for the site not only includes the aircraft, but also several articles and essays on the whole topic of re-working flight models. ■

Bernie Stafford

Real to Simulated Cockpit Adventures

From London to Washington, courtesy of Virgin (and Microsoft)

A short while ago Mike Clark, consultant editor of PC Pilot took a trip to Washington in the USA. Whilst on the trip Mike was given the opportunity to chat with the flight crew and sit in on the approach and landing on the flight deck. A couple of copies of PC Pilot Magazine were presented to the crew who it has to be said were very impressed with our format!

It speaks for itself!

When Mike returned we asked him if one could really recreate the experience in a simulator using popular enhancements that are commercially available for Flight Simulator. What follows is an exact account of events with a simulated twist. The products used in this account are Flight Simulator 2000, Final Approach charting software and Ultimate Airlines, the airline flight generator - both published by Just Flight. Mike takes up the story at the world's busiest airport…

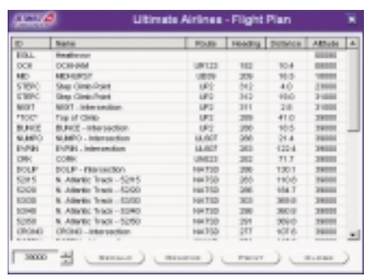
It all started one Friday morning as I was walking down what seemed an endless pier at London Heathrow's (EGLL) Terminal 3. The sun was shining and reflecting off the aircraft so I knew that this was a great opportunity to take photographs. I had allowed some extra time to take in the sites, sounds and smells of the UK's busiest airport. As the minutes ticked by I glanced at the aircraft I was to fly on: a Virgin 747-200 named 'Island Lady'.

The Island lady with our Simulated 747-400 version by Project Open Sky (www.avsim.com/posky/frames/index.html) sitting at Ramp 25 of Gary Summons' Heathrow scenery (http://fssharecenter.com/uk2000lhr).

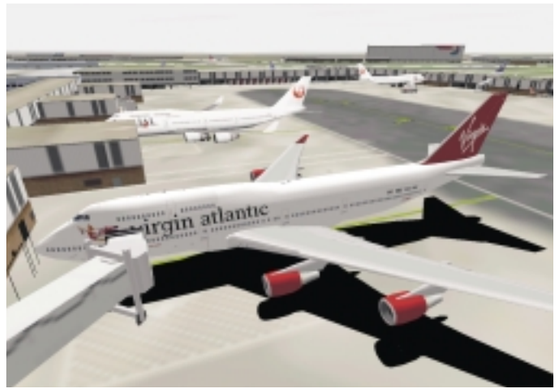
The flight number was VS21. Ultimate Airlines has this actual plan in its database and so I knew that I would not have any trouble recreating the flight when I arrived back home. As you can see from the Ultimate Airlines screenshot, a boarding pass is generated almost exactly the same as the original Virgin Atlantic one!

The aircraft looked awesome in the morning sun and I kept wondering if I could get inside the cockpit and see some action. "Premium Economy Passengers, please board now". That was my cue. "At last" My heart started pumping. I quickly gathered my bits and pieces and made a dash for the gate. The smell of aircraft fuel was all too apparent as I made my way down to the entrance. I was met by three happy, smiling faces of the Virgin Atlantic crew. The APU (Auxiliary Power Unit) was hissing frantically in the background as I

As you can see, we can accurately find our VS21 flight using Ultimate Airlines



The initial VS21 plan created by UA is a generic but can soon be edited to recall the real flight



Starting up and ready to go

Taxiing out and waiting for clearance on runway 9R

We soon became fans of Virgin

made my way into the cabin, dodging the drinks trolleys and passengers. I could feel the occasional thump and thud of cargo bay doors being slammed and the slight vibration of the aircraft being refuelled. "Like champagne or an orange juice sir." came a voice from behind as I manoeuvred myself into the spacious 'premium class' seat before me in row 20 (left side). "Thanks", I said and quickly launched into my sales pitch of who I was and what I do. My ultimate goal was to get into that cockpit and make new discoveries. Little did I know about the adventure I was about to embark upon.

"Ping Pong". The fasten seat belt signs lit. I started smirking to myself. Here I was being drilled about the benefits of the National Health Service by a doctor sitting next to me who occasionally picked his nose hair and slurped his champagne. All I could think about was that the crew were nearing the end of their checklists and we were about to be pushed back for engine start-up and taxi.

The captain then announced that the flight crew should do their cross-checks and before we knew it the gate was being retracted and we gently reversed out of the sanctuary of the terminal and onto the vast apron. There we sat for around a minute, "the captain's waiting for clearance for start-up" I thought to myself. Then, as I drank my last drop of orange juice and wondering what to do with the glass (don't you hate it when that happens?) an ultra low rumble started penetrating the cabin. The captain had started winding up number one engine.

As the rumble dissipated the engine fired up. For an old girl, the sound was surprisingly quiet. After all four engines had been wound up the lights flickered as the captain switched from APU to main engine generation. We throttled forward and commenced our taxi to runway 9R (94 degrees). "What a beautiful day", I thought, "This is great!"

There's always a sense of inevitability as you taxi toward a runway. You see the other heavies and narrow bodied aircraft twisting and turning in front of you and then catapulting themselves at 150kts into the morning sky. You just know that you are next and there is absolutely nothing you can do to prevent it. As we progressed I could feel the flaps being set to 10 degrees and worried slightly that the bearings on the landing gear needed lubrication as they emitted a low pitch whine as we turned tight corners. We waited for a minute as a Lufthansa 737-800 snaked onto the runway and took-off... It was our turn... We gently manoeuvred into position and I said, "here we go Mike, lets see if all the years of FS have paid off...."

Suddenly, the engines throttled up to 60% and you could feel the aircraft rocking forwards in anticipation. Brakes released, the captain pushed all throttles forward and I could feel myself being pushed back into the seat. We began to roll. Faster and faster we pumped down the runway but didn't seem as fast as something like a 767, for example. It felt like we were on the runway for ages and I believed that we were about to run out of tarmac any second. Then, the nose started gently lifting to 5, 10, 15 degrees and the feeling of sinking started taking over as the wings took flight and began to take the entire weight of the metal tube they supported. We gained altitude and speed faster than I had anticipated and it became apparent that the aircraft wasn't fully laden with passengers or cargo.

Up, up and away to Washington

This is what they mean by a window seat

As the nose dropped to 10 degrees (about 1500ft) and the flaps retracted to 5 we started our SID, which was a right turn to what seemed like 270, and continued an uninterrupted climb to cruise altitude. Not a cloud in sight, the world became miniature. We were flying and my ears started popping. When later planning the virtual flight in Final Approach I discovered that the actual SID was the westerly departure to COMPTON (114.35) via WOODLEY (352).

"Ping Pong". The fasten seat belt sign went out as we continued our assent to cruise altitude. Everyone made a mad dash for the toilets but I simply gazed out of the window and made mental notes of what had just taken place. I was in awe. I have to be honest, this was my first time in a 747. I had been on dozens of flights in the past but always missed out on a Jumbo. Having just fulfilled a childhood dream, I needed time to reflect on it.

After a short sleep, (I had been working since 3am the night before) a stewardess brought over some lunch. This is the point where I was more able to explain about my work at PC Pilot Magazine. The stewardess asked if I would like to meet the captain and first officer. "YES PLEASE!" I said, as I fumbled around with my bread and butter. I was desperately trying to maintain some kind of professionalism but failed miserably because I spat out a piece of cheese in excitement (like you do!) "Okay", she said, "I'll see what I can do." "Yeeeesss!" I muttered to myself and set about getting my camera ready for pictures.

After 30 minutes or so it was time to 'go upstairs' to the cockpit. I was taken by the hand and presented to the captain and first officer as "Mike Clark, the flight simulation guy". My initial thought when viewing the cockpit was that it was brighter and quieter than in the passengers cabin and actually quite familiar. I suppose that all the years of using flight simulation panels like Eric Ernst's must have prepared me for a moment such as this. I really felt at home and it has to be said that the crew were most welcoming and reassuring. The one thing that struck me when looking around was the amount of fuses that were mounted on various overhead and side panels. I suppose in simulators we don't have the luxury of seeing all this at once. It's these that make a cockpit look complicated and once you familiarise yourself with the layout there really isn't anything complicated about them at all.

The captain introduced himself as Jeff Glover and presented his First Officer, Kieran Kiely. Both were relaxed and well into their flight. After some initial discussions about flight simulators and aviation, I soon set about taking some photographs. After getting into the swing of things I cheekily asked for some promotional shots of them for PC Pilot. To my surprise they agreed! The Engineer was on a break and so I was fortunate enough to have plenty of room to move around and take some really good pictures. While taking these images the captain and first officer were kept busy with a copy of the magazine. I asked several questions while I was there about various technical aspects of flying a 747. I asked if I could hang around for the landing at which point the Captain and First officer glanced at each other, winked, and then said that they would speak to the Engineer and call me up later prior to making the decent into Washington. Was I chuffed or WHAT?

I then temporarily left the cockpit (with a huge grin on my face) and set about taking pictures of the flight crew while sipping a very sweet Virgin mug of coffee. Yes, I even had the pleasure of drinking out of a crew's mug too. Taking the photos of the crew was one of the bribes that helped me get into the cockpit in the first place.

After about an hour, I was asked to make my way back to the cockpit and prepare for landing. At this point the Engineer appeared. I was taken through the crews

First Officer Kieran Kiely perpares for the descent into Washington Dulles

We have no time to stop flying... but we will for a look at PC Pilot!

Looks complicated? Not really when you take a really close look!

Hmmm.. What would happen if I pressed this?

Who's flying? We gave you a copy of PC Pilot but this is simply too generous!

The Island Lady cabin crew - including Gemma, Lauren, Louise, Deborah and Lisa

Flight Deck Crew discuss landing procedure (note the fog)

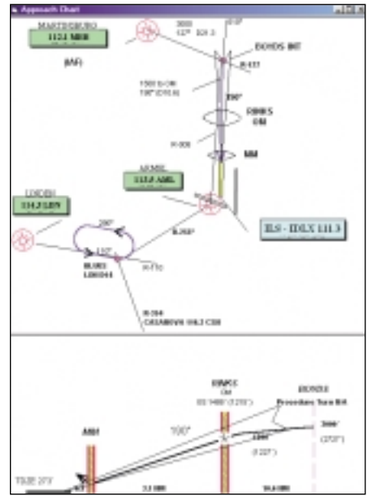
The Jeppesen chart of our approach into KIAD. The crew discuss the final procedure before making the approach

Where's that runway? It must be down there somewhere under all that fog

emergency procedure where it was explained where the exits were and what to do in case of fire. I then strapped myself into the jump seat with a crossover strap, like one found in a fighter jet and prepared my camera for taking videos. The captain gave me a headset so I could hear the entire conversation between control and flight.

As we switched from Centre to Approach the first officer explained everything he was doing. Even to the point of changing barometric pressure on the altimeter to 2991 when passing FL180. Suddenly, the captain took out a cloth from beneath his seat. "He must have a cold," I thought to myself. He then started wiping around the edge of the switch panel and above the windows frantically. "What going on?" I thought to myself and then asked the engineer. He explained that as an aircraft descends the ice that builds up at high altitude turns into condensation. Now, I don't want to make people panic when they read this, but the instrument panel was quite literally dripping with water! I was most surprised but the captain and first officer seemed to take it in their stride and acted as though it was perfectly normal (however, I started to pray).

Each of the crew had to hand a STAR for Washington Dulles - a Jeppesen chart that most of us are familiar with by now. For the simulation we used one from Final Approach. We were to arrive on Runway 19R from the north east. The crew soon started taking instructions from the approach controller for the descent and navigation to the last waypoint. To be honest, there was so much going on and it all happened so quickly it was hard to take everything in, but the upshot of what happened was that we descended from 37,000 through to 27,000 (350kts) to 17,000 (300kts) heading for Martinsburg VOR (MRB - 112.10). When passing through FL100 (10,000ft) we were instructed to reduce speed to 250kts - just as you would be instructed to do in ProFlight 2000. When we were around 15 Miles from the FAF (Final Approach Fix) and 25 Miles from MRB we were given clearance to descend to 4,500ft and turn to a heading of 220 degrees to intercept the localiser. We then descended to 3,000ft and asked to contact the tower when established on the localizer.



Our Final Approach chart of runway 19R at KIAD showing exactly the same features as on the Jeppesen chart

When we were fully established on the localizer we contacted tower on 118.70, further reduced our speed to 180kts and extended more flaps. "Virgin 21, cleared for landing". Now the interesting point came. The weather was pretty bad at Washington that day. It was raining, overcast at 600 ft, foggy, with a light wind from the south west. I remember the engineer turning to me with a smirk on his face and saying "you will like this" and I was soon to understand why. By now the flaps had been fully extended, the landing gear was rumbling down and our speed had dropped to 170kts - we were set for the landing.

You could not see your hand in front of your face. The only bit I remember was the captain disengaging the autopilot ("whoop! whoop!") and the runway appearing from nowhere. Flare, touchdown, reverse thrust, spoilers, lights flashing and thrusting forward as the aircraft rapidly decelerated. We then slowed ourselves to a crawl, changed to ground frequency (121.90) and taxied off the runway (left) at a smooth 15kts.

Bumping, hissing and whizzing noises started enveloping the cabin and we

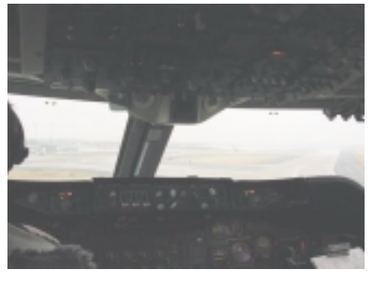
Gear down!

rumbled across the tarmac retracting flaps and spoilers. The air-conditioning cleared the air and the captain, first officer and engineer completed their post-landing checks in an eerily procedural fashion.

After working out where the gate was situated, and having it confirmed by ground, we were cleared to the gate for docking. As we mooched our way across the apron cars, lorries and weird looking terminal busses reassuringly appeared (in the same way as FS Traffic generates them). Then the familiar 'little people' dressed in fluorescent overthrows guided us to the gate with lollypops, points and thumbs up. We had completed our seven-hour hop in style. Not a glitch, not a worry, we were down safely.

Now the time had come to reflect on a wonderful and exhilarating experience and recreate it in Flight Simulator 2000…

Mike Clark



Rolling out of runway 19R at KIAD. Now we have to work out where the terminal is in all this fog!

Flight Sim Training

Professional instruction with Bill Stack

The charts used in these tutorials have been specially supplied and reproduced with kind permission of Jeppesen GmbH. These charts are NOT to be used for real-world navigation. They are for information ONLY. © 2000 Jeppesen GmbH.

BEFORE YOU START

A few prudent practices that professionals normally apply can make your flights as realistic as possible. The background about this tutorial will also help you enjoy flying while learning about it.

OUR FLIGHTS AND AIRPORTS

Today's tutorial will take us from Humberside International Airport in the north east of England to Norwich Airport in the east.

Humberside and Norwich Airports (EGNJ and EGSH, respectively) are general-purpose civilian airports serving their regions of England. Each handles commercial passenger and cargo traffic as well as general-aviation traffic. Norwich Airport officials say it was 'voted one of Europe's top regional airports.'

The Norwich Aviation Museum is just north of Norwich Airport. It boasts an ever expanding display of static aircraft, including the mighty Vulcan bomber. Read about the museum here: www.cnam.co.uk.

Humberside Airport is located just south of Kingston-upon-Hull, on the south bank of the Humber river. It is linked to the city by the world's longest single span suspension bridge – the Humber Bridge.

The major feature of today's flight will be the use of a DME-arc approach. These approaches follow a curved course at a prescribed distance from a central point. This point is usually about ten miles depending on the airport. At Norwich, it is eight miles.

OUR AIRCRAFT

We're still flying our Mooney Bravo. It enables us to cover sufficient distance in periods short enough to make our tutorials interesting and informative. Today's flight will take about one hour in the Bravo, a bit longer in a Cessna 182 and a bit less in a King Air.

THE CHARTS

Be sure to familiarise yourself with the Jeppesen charts we will use for these tutorials before embarking on this flight so you will know what to do aloft. These charts show the flight path, fixes and navigation aids. As well as the charts reproduced from the Jeppesen Sim Charts program that you'll see in this tutorial, we've included high resolution images of recent Jeppesen charts on the cover CD. For more information see page 11.

PROFESSIONAL FLIGHT PRACTICES

We continue to emphasise the need for following prudent aviation practices. Applying them or not can make the difference between a successful or a failed flight.

USE FLIGHT PLANS

You are free to use paper plans or an electronic flight planner. Paper plans are a bit clumsy to make but easier to use aloft. Electronic plans are easy to make, but using them aloft requires following submenus that disrupt the simulation.

In lieu of filing your flight plan with ATC (air traffic control) as real pilots do, imagine that you have filed in accordance with regulations. Keep your flight plan handy throughout the flight so you can easily refer to it. After your flight, file it in a folder or loose-leaf notebook.

NOTE THE TIME

Jotting down the time of significant events during your flight is a good idea. Note the time of take off, the time of passing significant fixes and navaids, and the time of arriving at the destination airports instrument approach procedures.

COMPENSATE FOR WIND

Be sure to account for winds in your plan, because deviations from your desired course will consume additional fuel and delay your arrival. Our issue 4 tutorial explains wind compensation in detail.

MONITOR YOUR PROGRESS AND STATUS

Throughout your flight, check your instruments for the status of your aircraft and engine. Check your position frequently with radio navaids, time/speed/heading and/or GPS. Monitor your engine-temperature, oil-pressure, fuel-flow and fuel-supply gauges. Correct as necessary to maintain desired course, altitude and performance levels.

SIMULATE AIR TRAFFIC CONTROL

This tutorial across eastern England will take you through sparsely travelled airspace. Nonetheless, the need for maintaining contact with ATC still exists. In lieu of ATC in your sim, remember that pilots must say when they're leaving an airport's airspace, when they enter an enroute airspace, and when they enter their destination airport's airspace.

FLY ONE STEP AT A TIME

While leaping over the basics and plunging into advanced flights is a great luxury of flight simulation, it is not realistic. Real pilots do not start at the end of the training course and work backwards, because it deprives them of the skills needed for meeting subsequent challenges. When flight simmers try to meet challenges for which they are unprepared, they frustrate themselves with poor performance and errors. So we strongly advise doing everything one step at a time and building your skills toward the next levels, just as real pilots do.

USE THESE TUTORIALS FOR SIMULATED FLYING

These tutorials are intended for computer flight-simulation, not for real-world aviation or real-world flight training. While making our tutorials as realistic as feasible, we have adapted them out of necessity to the limits and nuances of flight simulation, so some aspects cannot and do not apply to real-world flight. Therefore, we caution everyone to use these tutorials for their intended purposes, and we accept no liability for anybody's misuse of them.

OUR AUTHORS

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Learn more about flying like a real pilot from Bill Stack's flight sim books at www.topskills.com/flitsim.htm or contact TopSkills in Tennessee on 865-584-7340.

Bill Stack

REFER TO OUR PRIOR TUTORIALS

For space considerations, we will not repeat common aspects in every tutorial. If you don't have our previous tutorials, back issues are available from PC Pilot – visit www.pcpilot.net. Issues 1, 2 and 3 are now sold out, but we've re-published them in CD format, together with Tutorials 1-8. This is great value with prices from £7.99. For more details see our subscriptions page or the website.

Issue 1 Taking off, flying straight and level, flying traffic pattern, landing, simple ILS approach. London City (circuit)

Issue 2 Cross-country flight, VFR pilotage, IFR radio navigation, using SIDs, STARs, IAPs London City – London Stansted

Issue 3 Attitude flying, VFR dead reckoning, IFR NDB Approach London Stansted - Birmingham

Issue 4 Wind compensation, VFR with radio navigation, IFR VOR/DME approach Birmingham – Dublin

Issue 5 VFR scenic coastal flight, IFR fixes, holds, procedure turn, ILS approach Dublin – Glasgow

Issue 6 Night flying Glasgow – Manchester

Issue 7 Global positioning system Manchester – London Heathrow

Issue 8 Fuel calculation Heathrow – Cork

Issue 9 Flying a back course – Hanscom to New Bedford

Issue 10 LDA Approaches New Bedford to Brainard

USING A DME-ARC APPROACH

DME-arc approaches present an all-new challenge to our flight-sim readers. Instead of flying to or from a DME, as we have been doing so far, we will maintain a constant distance from it. The only geometrical way of maintaining a constant distance from a fixed object while we're in motion is to fly a circle around it. In a DME arc approach, aircraft fly part of the circle, which is what an arc is. This means you will turn left or right and simultaneously maintain a constant distance from a reference point. So, in addition to controlling your bank angle, attitude and altitude, you will also be using your OBI to maintain your distance from the DME. You'll enjoy this procedure!

FLIGHT SETUP

Prepare your simulator for your flight. It takes only a few minutes, and it makes your flight more challenging, more realistic and more fun.

SET UP YOUR WEATHER

As usual, we will use conditions that existed in late spring when we laid out these tutorials. For this flight, set your weather as shown in our weather table. You are welcome to use current conditions for a subsequent flight of this route.

Today's Weather Conditions

Visibility	5 miles
Wind	15 knots from 210 degrees
Clouds	Scattered 1/2 Ceiling 1,000 MSL Top 7,500 MSL
Precipitation	None
Temperature	51 F, 10 C
Dew Point	37 F, 3 C
Pressure	29.80in

Making the flight during daylight or night is your choice, because there is no practical difference for instrument flights. To fly at night, refer to our Issue 6 tutorial for details of night flying. To make the flight a bit more interesting, try taking off before dusk or dawn so light conditions will change enroute.

PREPARE YOUR AIRCRAFT

Be sure to prepare your aircraft for flight before taking off by setting your radios and gauges and turning on your lights. The following conditions generally apply to most flights. For this flight, choose the Mooney Bravo, preferably the IFR version. All our time estimates are based on this aircraft. You are free to fly this tutorial in other aircraft later. We will take off from Humberside's runway 21, because it most closely faces into our 210 wind. Start your flight at this point.

Additionally, we will calculate our fuel needs and carry enough for this trip, using the aircraft's average fuel-flow rate plus legal requirements to determine the amount of fuel needed. Remember that our Mooney Bravo uses about 16.5 gallons of fuel per hour from take off to landing.

SET UP YOUR AIRCRAFT

Make your aircraft ready for your flight. 'Buy' enough fuel based on your fuel calculations. Your fuel mixture should be rich, and your propeller pitch should be low at these low altitudes. The cowl flaps should be fully open while on the ground and during take off and climbout. The carburettor heat should be off, because it is not needed and its use will reduce performance when the best is needed. The pitot heat won't be needed unless the temperatures are below freezing and there's moisture in the air. As standard procedure, set your altimeter for local barometric pressure.

Turn on the lights appropriate for this flight. Nothing is wrong with using the position lights and strobes during daylight operations, even though they are required only for night flights. Strobes are required at night except when their reflections from clouds would present a safety hazard to the pilot. Landing lights are recommended for taking off, landing and whenever flying below 10,000 feet (3,050 metres) above mean sea level (MSL).

TUNE YOUR RADIOS

Although you can rely on your GPS for navigation, you still need your conventional radio navaids for airport operations and as a backup during the enroute portions. Set your Nav1 and Nav2 radios and your OBI for the first frequencies and radials you will use.

SET YOUR GPS

Engage your GPS by displaying it on your screen, then check the displayed course to be sure it reflects your desired flight path. Don't worry about SIDs, STARs or IAPs, because the Flight Simulator GPS does not reflect them. Set the map for 'north up', 'course up' or 'track up', whichever you like best.

As usual, pilots should know how to use the GPS devices in their simulators, that is, how to engage the devices, change view screens, select data and so forth. Read your sim's manual for instructions.

PREPARATION CHECKLIST

(This checklist is for these tutorials, only, and is not intended to be complete.)

Aircraft Settings

Engine:	running
Fuel supply:	adequate
Fuel mixture:	richest
Propeller pitch:	highest
Cowl flaps:	open fully
Wing flaps:	10% (specified by Mooney)
Carburetor heat:	off
Pitot heat:	as needed
Rudder:	straight
Ailerons:	neutral
Elevator trim:	neutral

Gauges

Altimeter:	local pressure
Amperes:	neutral
Vacuum:	green
Oil pressure:	green
Fuel pressure:	24 psi (specified by Mooney)

Radios

Nav1:	not needed
Nav2:	not needed
ADF:	365 (Humberside, KIM)
OBI1:	not needed
OBI2:	not needed
Com1:	118.55 (Humberside Tower)

GPS

Map view:	on
Orientation:	as desired
Zoom level:	as appropriate
Plotted course:	as filed
Displayed:	as needed

Lights

Beacon:	ON
Strobe:	ON
Position (navigation):	ON
Landing:	ON
Taxi:	ON

Clock

Local time or your choice

IFR (Instrument Flight Rules) Tutorial *Part 11*

The arc of approaching (or how to keep your distance)

This IFR (instrument flight rules) trip from Humberside to Norwich, provides new challenges as well as applying skills learned in our earlier tutorials. The DME arc approach requires close attention to the quality of a turn and distance from the relevant radio navigation aid. The enroute portion provides more practice navigating with NDBs (non-directional beacons) and DME (distance measuring equipment). The entire flight is about 100 miles and should take about 45 minutes from take-off to landing.

TO AUTOPILOT OR NOT TO AUTOPILOT

Whether to use the autopilot is our decision, yet the use of this device should not be automatic, itself. Real pilots use autopilot, so nothing is wrong with us using it. The main feature of an autopilot is to relieve the tedium of maintaining altitude, course and airspeed during long flights. It also helps to guide pilots of fast-moving and sophisticated jetliners through instrument approaches, holding patterns and other demanding manoeuvres.

But for us flight-sim pilots to engage various automated devices and let the sim fly for us, is rather silly. What's the point of programming the sim to fly all our procedures, then sitting back and watching it perform its assigned tasks like watching television?

Similarly, while the GPS flight planner, course plotter and autopilot are marvellous devices that add excitement to our simming, they also reduce the challenges by doing the flying for us.

So, for those of you who would like to figuratively get their hands back on the yoke and throttle, here are a few tips for flying this flight without the autopilot and course plotters.

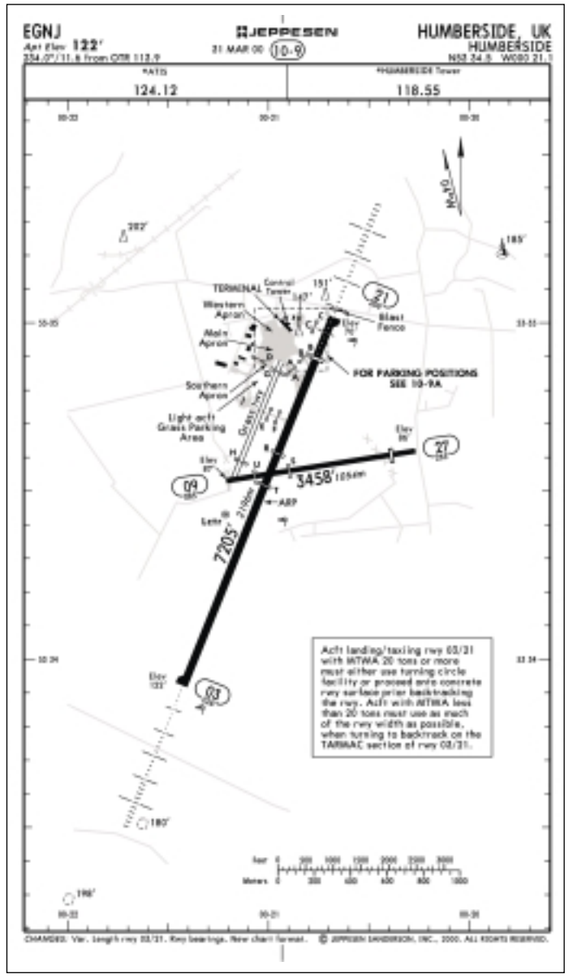
- Write a paper flight plan.
- Leave the GPS map disengaged.
- Maintain altitude with elevator trim.
- Compensate for wind by adjusting your heading.
- Track your course by using your VORs and OBIs.
- Plot your position by using time, heading and speed calculations.
- Plot your position by using DME distances from and to VORs.
- Note the times of your takeoff and arrival at key points.
- Note how much time elapses between key points.

For our tutorial, we flew this flight several times, and frankly, we enjoyed it more flying it hands on instead of hands off.

YOUR FLIGHT CHARTS

The charts for today's flight show the instrument procedures for all its portions: 1) departing Humberside (EGNJ), 2) flying through the open airspace of eastern England, and 3) approaching Norwich Airport (EGSH). Familiarise yourself with all relevant aspects of these charts before taking off so you won't have to fumble around enroute trying to figure them out. Because some of the instrument procedure charts are not to scale, the courses depicted on them are not precisely drawn. On these charts, follow the textual directions and use the graphical depictions for comprehension only.

Because ATC guidance is unavailable to us, we will suppose the guidance we might get and rely on our instruments for supplemental guidance.


EGNJ
JEPPESEN
HUMBERSIDE, UK
HUMBERSIDE
124.12
118.55
TERMINAL
Western Apron
Main Apron
Southern Apron
Light a/c Grass Parking Area
Blast Fence
FOR PARKING POSITIONS SEE 10-9A
3458'
7205'
ARP
Acft landing/taxiing rwys 03/21 with MTWA 20 tons or more must either use turning circle facility or proceed onto concrete rwy surface prior backtracking the rwy. Acft with MTWA less than 20 tons must use as much of the rwy width as possible, when turning to backtrack on the TARMAC section of rwy 03/21.

Humberside Airport

Our route from Humberside to Norwich

Departure

Humberside does not have standard instrument departure procedures for any of its runways. In lieu of these procedures and ATC guidance, we will simply turn left and head toward the first leg of our course toward Norwich. This means our enroute portion will begin as soon as we depart Humberside's airspace. The track distance between our takeoff and course interception is about five nautical miles.

Enroute

The enroute chart shows no airways between Humberside and Norwich. Therefore, we will simply plot a straight course from one to the other. We will fly southeast from Humberside NDB (KIM, 365), then we will lock on to Norwich NDB (NWI, 342.5) and fly toward it. We'll use other NDBs to triangulate our positions enroute. When we get near Norwich airport, we'll enter the approach procedure. The 'VORs' in the flight area are TACANs. These radio navigation aids provide distance readings but no radials, so their usefulness for plotting courses is limited.

Without a charted airway for us, we will choose our own altitude. Remember that southeasterly flights in England must use odd altitudes plus 500 feet, such as 7,500, 9,500 and 11,500 feet MSL (2,288, 2,898 and 3,508 metres respectively).

Arrival

Norwich lacks prescribed arrival procedures, so we will join the approach for Runway 27 at the appropriate location.

Approach

With our winds coming from the southwest (210), the runway at Norwich will be 27. The IAF (initial approach fix) for this approach is unclear for northerly and southerly arrivals. For easterly arrivals, it's clearly D10.0, but we're not arriving from that direction, so that fix is no use to us. Consequently, we will turn left at the appropriate point and intercept the DME arc for runway 27. Here's our pilot's report (PIREP) based on our experience at this airport: The DME for runway 27 in Flight Simulator 2000 does not have adequate range to execute this procedure properly, so we will need to adapt our procedure accordingly.

The profile view shows a simple step-down procedure. Aircraft maintain 2,000 feet (610 metres) MSL throughout the DME arc. When they turn toward the runway, they step down to 1210 feet (370 metres) MSL. When they pass the locator shown on the chart, they step down to the minimum descent height of 420 feet (128 metres) MSL.

The challenging part of this approach is the DME arc, which requires close attention to the quality of our turn as well as our distance from the navaid. The rest of this approach is similar to those we have done in previous tutorials.

PLAN YOUR FLIGHT

Based on these charts, lay out the course you will fly from Humberside to Norwich. Include the relevant airways, navaids, intersections and fixes shown on the charts.

Electronic Flight Planner

If you use Flight Simulator 2000's electronic flight-plan feature, you can include all needed navaids, intersections and fixes. When this feature is used, the global positioning system (GPS) window will show your course to these fixes and the destination airport. If you chose to not use it, you will need to head toward them until the fixes appear on the GPS map, then head directly to them. Or, you can revert to conventional radio navigation and forego the GPS guidance altogether. You might try the flight once with electronic flight planning and once without for the different experiences.

To use the electronic flight planner, enter the following data.

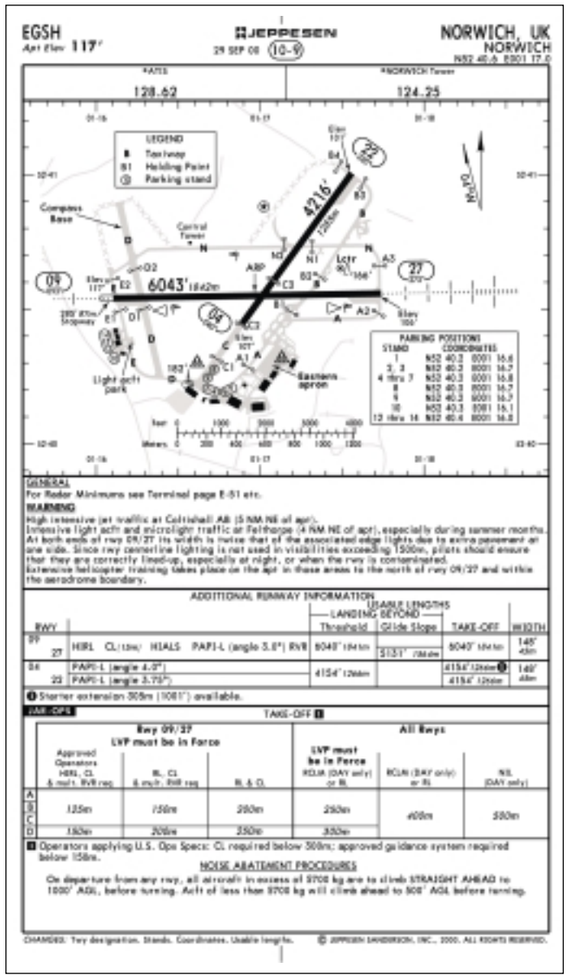
Departure: Humberside Airport (EGNJ) Runway 21

Arrival: Norwich Airport (EGSH) Runway 27

Alternate: Ludham Airport

Waypoint: Humberside NDB (KIM)

Waypoint: Norwich NDB (NWI)



Norwich Airport

Paper Charts and Flight Plans

The electronic flight planner is handy, and the old-fashioned paper charts and flight plans are still useful for seeing our course and estimated times at a glance. We've included a sample on the cover CD.

PREPARE YOUR AIRCRAFT

To make your aircraft ready for this flight, use our abbreviated checklist in our 'Flight Setup' section.

TAKE OFF

Take off normally, including cockpit preparation and appropriate ATC clearances, as explained in our previous tutorials. Additionally, check your engine instruments. The Bravo's manifold pressure should be at or above 38, and the oil pressure should be at least 24. The Bravo should lift off at about 60 to 65 knots. If you use other aircraft for this flight, its performance characteristics will differ from these.

During takeoff and climbout, you will have a brisk headwind. Coincidentally, it's exactly in line with our take-off heading, so it will not blow us off course until we turn left and head toward Norwich.

Climb out at about 85 knots. During your climbout, adjust your cowl flap as necessary to keep your engine temperature in the green range - not too hot or too cool. Retract your flaps at about 90 knots. After your initial climbout, your Bravo should be able to climb easily at 700 feet per minute and 120 knots.

DEPART HUMBERSIDE

Without a departure procedure, we have no prescribed climb rates. So use typical procedures by climbing at 85 knots to 1,000 feet (305 metres) AGL. With this airport's elevation being 122 feet (37 metres) above sea level, a 1,200 feet (366 metres) MSL altitude will be suitable. When you reach this altitude, turn left 120 degrees at a 20-degree bank and head 090 for a couple of minutes while continuing to climb.

A few minutes after heading 090, you will intercept the 136 bearing of Humberside NDB (KIM). Just before intercepting this bearing, turn right and align your flight with, the bearing from KIM. Continue climbing toward your cruising altitude. In a few more minutes, you will exit Humberside's airspace.

Fly Enroute

After leaving Humberside's airspace, continue climbing to our cruising altitude of 9,500 feet (2,898 metres). Until you change heading near Norwich, you will have a brisk southwesterly crosswind pushing your aircraft toward the northeast (toward your left), so adjust your heading to compensate. Stay on KIM's 136 bearing until its reception is lost. Then switch to NWI and turn on the ADF audio so you will be alerted when the signal is received. For about ten minutes of the enroute portion over the North Sea, you will not be able to receive either NDB. Maintain your 136 heading until you receive NWI.

If you are using the GPS course plotter, which shows on the map screen the courses from origin airport to the fixes to the destination airport, simply follow those course lines for each segment. If you are using GPS but not the course plotter, maintain your 136 heading from KIM.

While GPS makes navigating and plotting very easy, it also eliminates the challenges that make these flights interesting. So to avoid the likely boredom, try relying on common radio-navigation methods for maintaining your course and plotting your positions enroute. The following NDBs are handy for plotting your position enroute: Cranwell (CWL 423), Fenland (FNL 401) and Shipdham (SDM 348.5)

Remember from previous flights that your engine will behave differently at various altitudes. The higher it gets, the less oxygen it will have for combustion, so you will need to adjust the fuel mixture to compensate, otherwise the engine will not perform. The engine is performing best when the TIT (turbine inlet temperature) gauge reads 1750, so adjust the mixture until the TIT returns this reading. Do not exceed 1750, however. Again, these performance readings do not apply to other aircraft.

Icing will be likely in these clouds and temperatures, so engage your Pitot heat and propeller de-icer.

Conserve fuel by changing the propeller pitch at higher altitudes. We found that the Bravo cruises easily at 170 knots and uses 15.16 gallons

Failure to plan is to plan for failure!

Our Bravo over very flat Lincolnshire countryside

of fuel per hour with the following engine settings: RPM 2,000, manifold pressure 30 and TIT (1300). If your engine is using fuel too fast, you could run out of fuel short of your destination.

Cruise Enroute

Once you have attained our 9,500 feet MSL cruising altitude, you may engage your autopilot or maintain altitude and heading manually. Using autopilot relieves repetitive tasks, but being relieved of things to do makes the flight boring. Be sure your cowl flaps are closed whenever cruising. They are not needed, and they increase drag.

This region of England is sparsely populated, and the chart reflects that. There are few airports available in case of an emergency, and most of them are military fields. The countryside you might see through breaks in the clouds will be sparsely populated farmland. For about 25 miles, you will fly over a bit of the North Sea, so you will see clouds and water for about ten minutes. The total enroute portion of your flight will last about 25 minutes.

Check your fuel supply enroute. If you estimated fuel needs accurately and embarked with the needed amount, you should have plenty of fuel to reach your destination. Fuel supply should not be a problem on short flights such as this, but you could run out of fuel short of your destination if your calculations were wrong, your engine is using fuel faster than expected or your aircraft is leaking fuel. Look for an emergency airport if necessary.

When you receive NWI, align with its 136 bearing, then head straight for it. If you have maintained your course accurately, you should be right on or very close to this bearing.

Descend Toward Your Destination

Remember our simple rule-of-thumb formula for determining when to begin descending: number of feet to descend times 0.003. We are cruising at 9,500 feet, and we need to descend to 2,000 feet for the DME arc, so the number of feet to descend is 7,500. Multiplying that number times 0.003 gives us 23 nautical miles. This means we should start descending no closer than 23 miles from Norwich. We should be at our 2,000 feet altitude when we reach the DME arc, and the DME arc is eight miles out, so we should begin descending when 31 miles from the airport. If all goes well, we should arrive at the DME arc at or slightly higher than 2,000 feet MSL.

How will we know when we're 31 miles from Norwich? We found that the DME at Norwich Airport reaches about four miles in the area northwest of the airport (that's our PIREP), so it's useless for plotting our position this far out. The first three of the following four position-plotting methods are accurate enough for deciding when to begin a decent but not for other purposes.

- Coltishall TACAN (CSL 116.5) provides DME signals, and it's about five miles northeast of the airport. Because of its position relative to the airport and our course, we would be about 31 miles from the airport when this DME reads 31. This coincidental condition applies to this flight only, and the plot won't be precise.
- A position 31 miles from Norwich airport and along our course would be about 45 miles from Humberside. At 160 knots in the Bravo, we will travel this 45-mile distance in 17 minutes. Having written down the time we started the enroute portion of this flight, we can advance 17 minutes and use that time to give us a general idea of when we arrive at the needed position. Although this method isn't pinpoint accurate, it's the same time-heading-speed method used by aviators since the earliest days of flying.
- A more accurate method than either of the previous two would be to literally measure a point on the chart 31 miles from the airport on a 316/136 bearing, then triangulate on the NDBs. At this position, FNL would be 100 degrees from us on the ADF. When we're heading 136 and the ADF shows 0 for NWI and 100 for FNL, we're at this position. Although this method isn't pinpoint accurate either, it is a radio-navigation method that military, commercial and general-aviation pilots have used for decades.
- The most accurate method would be to read the distance from the airport on our GPS map. Avoiding this easy method will give us practice with navigation and position plotting as well as something meaningful to do with our time and minds.

Whichever position plotting method you choose, start your descent when you reach this position enroute.

APPROACH NORWICH

As you get closer to Norwich airport, perform these important tasks: (1) readjust your altimeter for local pressure, (2) turn on your landing lights, (3) switch to the tank containing the most fuel, (3) adjust the propeller and fuel mixture as needed, (4) recheck your fuel quantity, and (5) disengage your autopilot. If you are dangerously low on fuel, request emergency landing procedures from ATC. Otherwise, follow the published approach procedure.

Change your navigation radios to receive the radio navaids you will use for the approach. Change Nav 1 to 110.9 for runway 27's instrument landing system (ILS) signal, and change your ADF to the other Norwich NDB (NH 371.5).

Join the Approach Procedure

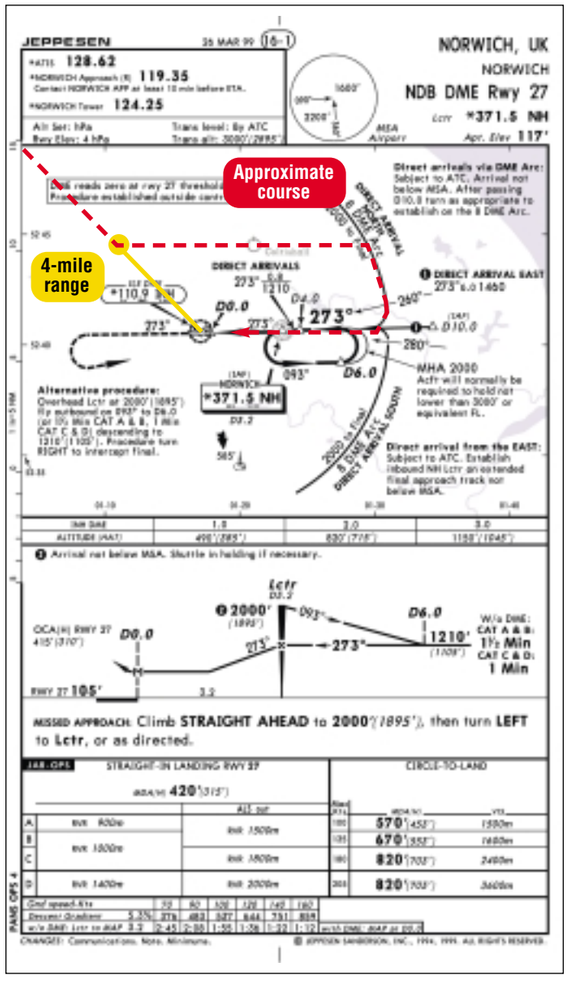
Normally, we would fly to a point eight miles from Norwich Airport according to the ILS's DME, turn left and head 090 to intercept the DME arc. Remembering our PIREP about this DME's four-mile range in Microsoft Flight Simulator 2000, we must deviate from the prescribed procedure and fly until we receive this DME reading, which will be well inside the eight-mile arc. We also found that the DME reaches more than eight miles east of the airport, so it can be used for executing the eight-mile DME arc for runway 27.

TIP: Make a flight/situation here so you can practice entering and following a DME-arc course.

When you are eight miles from INH according to your DME, turn right and head about 150 degrees to enter the DME arc.

Follow the DME-Arc Course

Once you are heading 150, change heading as necessary to stay exactly eight miles from INH. If you are further than eight miles, turn right slightly to get closer. If you are closer than eight miles, turn left slightly to get farther. When you are right on eight miles, turn gently toward the right to stay eight miles from INH throughout this arc procedure. Following this procedure requires some adjustment and practice, so practice it repeatedly until you find it easy to do (that's why we recommend making the flight).



The approach for Norwich

Turn Toward the Runway

When your ADF shows NH at about 085, turn right 90 degrees and head straight for NH. Adjust your course so you will be heading 273 and straight toward the NH. Be sure to pass right over the NDB, too. Once you pass it, descend to 420 MSL as shown on the chart and head 273 toward the runway. Ignore the holding pattern depicted on the chart unless you need to make a missed approach. When the runway appears ahead of you and you are positioned for a safe landing, land normally.

Missed Approach?

If you are not positioned for a safe landing, execute the missed approach. The chart calls for climbing straight to 2,000 MSL, then turning left toward the locator, or as directed. The referenced locator is NH.

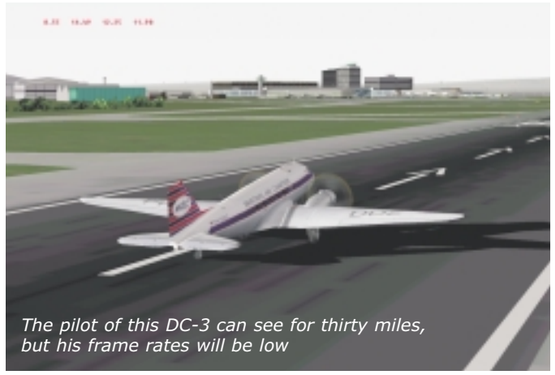
CONGRATULATIONS

You have successfully approached an airport using a DME-arc approach. Well done, indeed!

Keep flying this tutorial to build your proficiency. Apply stronger winds and turbulence and advance to more sophisticated aircraft to make it more challenging if you like. For more information about navigation and instrument flying, read Bill Stack's Flight-Sim Navigation and Instrument Flying for Flight-Sim Pilots www.topskills.com/flitsim.htm

See you next time. ■

Bill Stack



The pilot of this DC-3 can see for thirty miles, but his frame rates will be low

Lowering the visibility will provide you with an instant performance boost!

This one can only see for three miles, but he won't stutter so much

1.2 GHz - BUILT FOR COMFORT AND FOR SPEED

G-g-g-goodbye F-F-F-Flight Simulator 2000!

Ever since Flight Simulator 2000 was released all those years ago – well, October 1999 actually - a well-known fact has been repeated (almost painfully!) in reviews and forums with regards to PC performance - processor speed was by far the most significant factor when it came to frame rates. Fortunately, AMD and Intel have continued to bombard consumers with faster clock speeds, new architectures and lower prices. The chip behemoths are releasing clock speeds of 1.5GHz, 1.7GHz and even 2.0GHz, with the bread and butter residing in the 1.0-1.2GHz range. In this feature we decided to examine the benefits of a 1.2GHz CPU and see if it could once-and-for-all eliminate the most annoying aspect of Flight Simulator 2000, the dreaded shudder. Remember, in the 'Specifications' on the side of the box, Flight Simulator 2000 should run with a PII 266 and it does, after a fashion. However, just before Flight Simulator 2000 is consigned to history, we thought we'd see if it's ever going to run stutter-free.

The Next Generation

Reports from the Fanstock seminar, in which Microsoft revealed Flight Simulator 2002 in beta, have been refreshingly in synchronization. Without exception, all seem to agree that it performs with absolute fluid-like smoothness, some testers feeling quite ecstatic about it. A Pentium III 800MHz processor based system was the platform many used, so it seems safe to say we can look forward to an autumn release of the next generation sim from the Redmond crew. Could it be that Microsoft has finally learned a lesson or two from the thousands of disgruntled users of Flight Simulator 2000?

Meanwhile, the summer of 2001 is NOW, leaving us with PCs that perhaps have undergone several evolutionary steps in the last two years. Many of us have worked countless hours or spent hard-earned cash in an attempt to eliminate the pauses and bumps so intrinsic to our current sim from Seattle. Although this crusade may end in the autumn, there are so many superb add-ons available, perhaps it is not fruitless to examine the results of yet another round of flight test numbers.

Frame Rates: Do they tell the Whole Story?

Frame rates are most certainly the de facto criteria for measuring 3D performance on PCs. Flight Simulator 2000 seems to posses a peculiarity relative to this. On any given 'flight test', the average frame rate could be a respectable 30 frames per second, however this does not mean it performs fluidly. Why this discrepancy?

The frame rate counter with which Flight Simulator 2000 is equipped (Shift + ZZ keys) measures the average frame rate of a given situation. A particular timed flight (such as a video) might have a high frame rate of 60fps and a low of 5fps resulting in 65/2=32.5 average frames per second. What happened at that moment when '5' reared its ugly head? This is the point at which the stutter is noticed, also known as lag time or latency and may occur for one of many reasons. The resultant 32.5fps truly did not include the stutter that occurred at this 'instant', so effectively we had an instantaneous frame rate of 5, which is clearly unacceptable. Why?

Studies have shown that lag times (stutters) that exceed approximately 100ms (milliseconds) are detectable by nearly everyone and drastically reduces the ability to manipulate and control objects in a simulation or fast paced gaming environment. Any frame rate under 29 has a latency of over 100ms, and this is where controlling aircraft might get ornery. If you've ever slammed a plane on the runway during landing and wondered why, this may be your answer. Complex airport scenery, FSTraffic aircraft, and glass cockpit panels can cause CPUs to buckle at the knees, bringing frame rates to ridiculously low levels. WHAM! you just broke the nose gear!

It is this instantaneous frame rate that we are more concerned with at this point, given the fact that our hardware test bed consists of an AMD 1.2GHz Athlon processor. This was the fastest CPU we could obtain for the test, designed for the VIA KT-133A chipset. It's front side bus of 266MHz adds a little more punch than the previous 200MHz model we recommended last issue. Can 1.2GHz worth of CPU muscle eliminate those annoying stumbles? In fact, are the pauses hardware related? This was our final quest to answer these questions.

Three flight scenarios were examined, all at 1280x1024x16 resolution, with texture maps and MIP-Mapping enabled. The CPU clock speed, being adjustable in the system BIOS, allowed for a comparison of CPU speeds ranging from 933MHz to 1333MHz. Since instantaneous frame rates is one of our concerns, there are three sets of numbers for each flight; naturally the overall average frame rate, the high and the low, with low revealing the time lag or stutter factor for a given flight. Timothy Gregson's excellent 'Frate2K' utility was used for measurements, as it offers the full range of frame rate numbers - low, high, average and instantaneous.

Test Platform

Athlon 1.2GHz (9 X 133MHz)
EPOX 8KTA3+ Main Board
256MB CAS 2 Infineon Memory
Visiontek GeForce 2 MX Video Card (32MB)
Maxtor 10GB 7200rpm UDMA 66 Hard Drive
Guillemot Maxi Sound Muse
Windows Millenium
AETI AFCS II Yoke
Simped Vario Pedals
Flight Simulator 2000 Pro with Patch 2

Display Settings in Flight Simulator 2000

Texture Quality: 3
Terrain Mesh Complexity: 100
Terrain Texture Detail Distance: 100
Land Class Complexity: Extremely Dense
Max Unlimited Visibility: 100mi
Aircraft Shadows: Enabled
Ground Scenery Shadows: Disabled
Dawn/Dusk Texture Smoothing: Enabled
Smooth Transition View: Enabled
Image Smoothing: Enabled
Terrain Transitions: Enabled
Dynamic Scenery: Disabled
Scenery Complexity: Extremely Dense

7.30 FPS results in a pretty bad stutter!

On the ground at Meigs, the performance is fine – it's when you start f-f-flying that things go wrong!

Test Flight Descriptions

The 'Meigs Default' is a reading taken from the cockpit of the Cessna, using the preset weather conditions and allowing 30 seconds for stabilization of the simulation.

The 'Meigs Pattern' flight test consisted of a take-off on runway 36, turning left crosswind, left downwind, then executing a teardrop left turn to 330 degrees. This tight turn encompassed a great deal of the Chicago skyline, which is very demanding on hardware.

'Iowa' is a short flight, in spot plane view, from a grass strip in corn country. Iowa, USA is a state not known for its big cities, but rather for its dull landscape ("we call it tranquil!" – Iowa Dept. of Tourism). This provided a test that could potentially reveal if the latency issue was resolved in a simplistic environment.

	933MHz (7x133)			1GHz (7.5x133)			1.1GHz (8.5x133)			1.2GHz (9x133)			1.33GHz (10x133)		
	L	H	A	L	H	A	L	H	A	L	H	A	L	H	A
Meigs Default	23	34	32	26	37	35	28	41	38	29	41	40	31	45	42
Meigs Pattern	12	50	32	13	55	34	14	59	37	15	59	38	16	62	41
Iowa	16	41	35	17	45	36	20	47	39	21	47	40	24	51	42
Overall	17	42	33	19	46	35	21	49	38	22	49	39	24	53	42

L= Lowest (frame rate)
H= Highest
A= Average

Conclusions and Thoughts

The most significant numbers, in the 'L' or 'Lowest' column, tell a rather disheartening story: when overclocking even to 1.33GHz, instantaneous frame rates dropped to below 29fps in three out of four tests. While the overall numbers steadily rise as CPU speed increases, the latency problems are still rather evident and can be detected with a not-too-experienced eye.

Perhaps to drive the final nail in the coffin, we moved the display settings full left (absolute minimum) while running at 1.33GHz, and took a reading in the 'Meigs Pattern' flight video. The 'L' figure remained precisely where it was at maximum settings, indicating that the scenery has nothing to do with these pauses. This is pretty radical thinking, as most people will tell you that lowering the display settings increases frame rates. The key point is that it may improve averages, but the lowest rate is still pretty low.

It is not all bad news however. If we consider the fact that visibility and display settings, which were very aggressively configured during these flights, have dramatic effects on performance, it is possible to make significant gains in average frame rates by lowering them. Overall the simulation performed well and the CPU speed boost was indeed noticeable. Still, one would like to believe that 1.33GHz was capable of running the program totally smoothly, but such is not the case. We conclude, finally, that while Flight Simulator 2000's black eye was not mended, upgrading beyond 1GHz is a certainly a productive step. It also puts that PII 266 rating on the box into sharp perspective!

Flight Simulator 2000 brought fantastic new features to home simulators, causing many simmers to even remove FS98 from their computers forever. Regardless, this simulation has never performed as wonderfully as it should have. If the final version of Flight Simulator 2002 proves to be as sweet as the previews have reported, then 1.2GHz should handle it with ease. Perhaps next autumn, video cards will stage a comeback as the performance bottleneck champion in flight simulation! ■

Greg Gott

Me109 in IL-2 running under GeForce 2

Get a degree in hardware at the PC Pilot University!

Put Your Cards On The Table

You're happily cruising over London in your LearJet and the frame rate goes south. Frustrated, you fire up Rage's Eurofighter Typhoon. Everything is fine until you get into a dogfight with a pair of Sukhoi's - there goes the frame rate again. Time to upgrade from that old 16Mb graphics card to something beefier!

Your 650 MHz Pentium III is up to scratch and with 256Mb RAM you're doing ok. So now you need to purchase … an ATI Radeon? A Hercules 3D Prophet 4500? Elsa's Gladiac 920? Or maybe you should wait for a Radeon II?

Video hardware has become one of the most complex parts of your desktop PC, and can make or break your machine. A 3D accelerator is often the bottleneck in information flow to your favorite simulations. But how do you choose between all the horses on the track?

The Contenders

First, don't be confused by brand names. The silicon brain inside Elsa's Gladiac 920 also inhabits Hercules 3D Prophet III. Instead of focusing on brand names, you need only consider the brain that drives the board.

The main contenders are:

nVIDIA GeForce 3 GPU

nVIDIA GeForce 2 GPU

nVIDIA GeForce 2 MX

Imagination Technology KYRO II

ATI's Radeon

Until Matrox releases a new chip, they are no longer in the running. Their recent Millennium G450 is business hardware only, and slower than the G400 in games, plus there's news that the G800 is a non-starter.

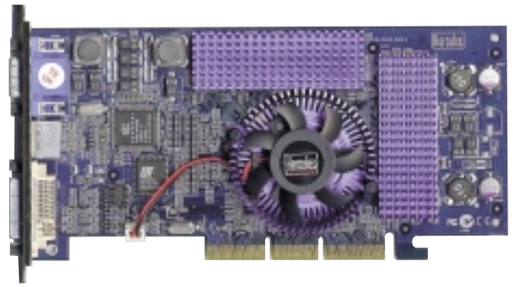
If you are buying for the future and price is no object, go to your nearest vendor and pick up any GeForce 3 based board. Elsa, Hercules or Creative all have plenty of experience with video hardware.

That leaves us to consider ATI's Radeon, versus the new KYRO II based cards and the last generation of nVIDIA chips in their many guises: the GeForce 2 and GeForce 2 MX series.

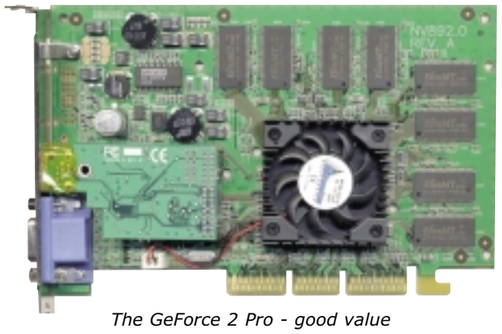
We can eliminate the Radeon from consideration. It's roughly the same speed as the budget nVIDIA hardware (the MX series) but costs more. Besides, with the arrival of KYRO II boards, you can have more horsepower for less cost. We are left with nVIDIA's GeForce 2 chip and the new KYRO II (a Radeon II will show up soon, but information is scarce).

If your budget is flexible but you don't want to pay the premium for the latest hot video hardware, look for a good price on any brand using the GeForce 2 and get the Pro version. This version sports faster memory and more of it, and prices are falling with the release of nVIDIA's new GeForce 3 hardware. But what about KYRO II based video hardware?

The GeForce 3 – Bank managers from Tooting to Toronto are getting worried!



The 3D Prophet (or should it be Profit?)



The GeForce 2 Pro - good value

nVIDIA's GeForce Family

First let's take a closer look at the many varieties of GeForce 2 boards, and then we can put the new KYRO II hardware, like Hercules 3D Prophet 4500, in perspective. We'll close with a brief look at the future of video hardware with DX8 compatible boards like the GeForce3 and Radeon II.

nVIDIA has more versions of their GeForce 2 boards on the market than Just Flight has add-ons! In fact there are six versions in AGP, and a seventh for those old PCI slots on Pentium II machines.

Three of the AGP versions now come with a full 64Mb of video memory. The Ultra (the fastest GeForce 2 board), the Pro (the second fastest) and now even the MX are available with 64Mb of memory.

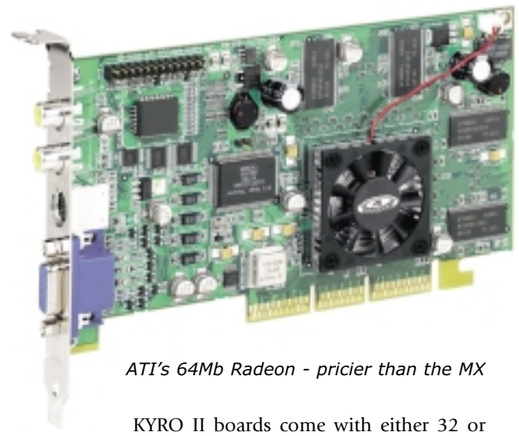
With current games there isn't a great advantage to extra memory, but it doesn't hurt. The Ultra is the most expensive of the three GeForce 2 boards, with super fast double data rate (DDR) memory. The Pro now has fast memory also, but the main clock speed of the board is lower. The MX has the slowest memory of the three.

Virtual pilots on a budget should look seriously at the Pro or the MX 400 now that prices are falling. The reason for this is the new KYRO II as seen in the VideoLogic Vivid!XS and Hercules 3D Prophet 4500.

The GF3 properties tab

New Technology: KYRO II

This new chip uses a fresh approach to rendering images. Rather than using a larger hammer, Imagination Technologies uses a sharper nail. By working smarter with new technology, they get away with greater simplicity, meaning a fast board that costs you less.



ATI's 64Mb Radeon - pricier than the MX

KYRO II boards come with either 32 or 64Mb of slower, less expensive SDRAM. Although this means less bandwidth, the streamlined rendering process requires much less. In short, the hardware tests whether or not a polygon is rendered before it is actually drawn. This method saves the hardware from having to draw and output polygons to the screen that will end up being hidden by other objects anyway. The increase in rendering efficiency is as high as 300%.

The weakness of the current KYRO II generation is that it is DirectX 8 compatible, but not compliant, limiting future growth. But as a competitor for GeForce 2, the new chip is an excellent solution.

The Latest and Greatest

So what about GeForce 3? How fast is it and what do the new features give you?

The theoretical fill rate is lower than GeForce 2, but in practice it's more than 40% higher. In Quake II HQ (not a flight sim, but equally demanding) at 1024x768 and 32 bit color, GF3 is 20% faster than GF2. In current games the difference isn't always noticeable.

GF3 supports a wide range of new features available in the latest DirectX 8 API. Not only does it sport the same integrated 'static' transform and lighting engine as the GF2, but adds a programmable vertex processor and programmable texture operations. As a result, game developers are able to include new effects previously seen only in films. Some of these effects are nothing short of spectacular.

But what difference does that make with current titles? Not much. Eventually, in programs where DirectX 8 features are fully exploited, sims could run up to 60% faster. (To view nVIDIA demos visit www.nVIDIA.com/Powerof3D.nsf)

Decisions, Decisions

If you are buying for the future, wait for GeForce 3 prices to fall or the introduction of ATI's Radeon II. If you are buying for today's products and can afford them, GeForce 2 Ultra and Pro are powerful and will soon be bargains. If you are on a budget, consider the GeForce 2 MX 400. KYRO II falls between GeForce 2 Pro and the MX in benchmarks, making it an excellent option at a lower price. But purchase from a supplier that will let you return a card if you run into trouble, especially with new technology like the KYRO II or Radeon II. We hear many tales of woe from readers who have card problems and (amazingly) they often say that their dealer won't let them swap! ■

Leonard Hjalmarson

CARD SCHOOL ON THE NET!

You can find out plenty more about how to improve your graphics (and empty your wallet) on the Internet – try these sites for more pixellated polygons:

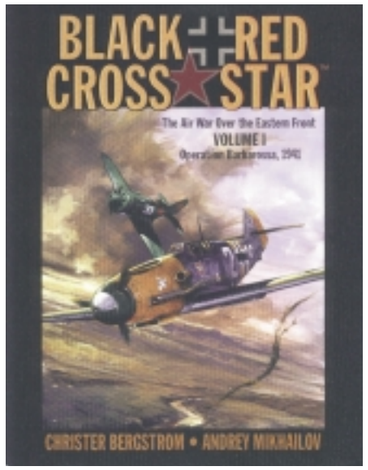
www.nvidia.com

www.powervr.com

www.ati.com

Black Cross Red Star

The Eastern Front in words and pictures


BLACK CROSS RED STAR
The Air War Over the Eastern Front
VOLUME I
Operation Barbarossa, 1941
CHRISTER BERGSTROM • ANDREY MIKHAILOV

Black Cross Red Star is the first of a multi-volume series that centres on the struggle for air supremacy on the Eastern Front, beginning with Operation Barbarossa, the German invasion of Russia, in 1941. Christer Bergstrom, a Swedish expert on the Luftwaffe and first-time Russian author Andrey Mikhailov, bring clarity and vision to an epic struggle hitherto clouded by the politics of the Cold War.

How many well-intentioned historians have stated as fact that the most produced aircraft in WWII was the Me109? In fact, the award goes to the Russians and the IL-2 (more than 36,000). How many historians have recognized that the highest scoring Allied aces were Russian? Furthermore, the best dogfighter of the war is usually identified as the A6M2 Zero - more likely it was the Yak 3.

The volume is filled with solid research and gripping first person accounts, illustrated by black and white photographs, many of them never seen before. Bergstrom and Mikhailov consulted many military experts and German and Soviet veterans to ensure accuracy.

The initial chapters document the doctrine, training standards, materiel and tactics of the two air forces. The reader learns how the initial wild success of Blitzkrieg tactics heavily influenced all aspects of Luftwaffe strategy, and explains the German lack of strategic bombers. The Soviet Air Force (or 'VVS') in turn relied heavily on a ground attack aircraft force capable of providing the Red Army with close air support. The Luftwaffe had a lengthy training regimen for its pilots and its ranks were swelled by combat veterans. The bulk of VVS pilots hadn't moved beyond basic training and lacked proficiency in air combat manoeuvring and gunnery (with exceptions provided by their own veterans).

It provides excellent coverage of the well known aircraft. The majority of VVS fighters - stubby I-16 monoplanes and I-15 and I-153 biplanes – were already dated, but the VVS was in the midst of a modernisation program when the Germans attacked. The MiG-3 (flyable in Maddox Games new sim IL-2 Sturmovik), and LaGG-3 were just coming into service. Likewise the Yak-1 began to appear in July, 1941, finally giving the VVS an aircraft superior to the Me-109F.

The volume analyses the phases of the air war along the three major German axes of advance. It also devotes a section to the critical battles in the arctic region around Murmansk, the gateway port for the Anglo-American convoys bringing Lend-Lease equipment. That the Soviet Union and the VVS survived the German onslaught with its resulting horrific losses in territory, people and planes is a remarkable feat. The recovery of the VVS, deteriorating weather

Remains of two I-153s. On the first day of war, close to 2,000 Soviet aircraft were destroyed on the ground

Soviet pilots approach their I-153s during the winter of 1941-42

conditions, and German errors and miscalculations are cited as key factors in Russian victory.

Soviet acronyms, units and ranks can seem daunting at first, but the authors provide an excellent glossary to assist the reader. The book also provides a set of maps to assist with unfamiliar geography. ■

Leonard Hjalmarson

REVIEW SCORE:			
Publisher:	Pacifica Military History	**Price:**	£29.00 (approx)
Developer:	www.pacificamilitary.com	**Release Date:**	Out Now
Authors:	Christer Bergstrom, Andrey Mikhailov		

At a glance: A superbly detailed account of the air war over the Eastern Front. If the other volumes are of the same standard, this will be a 'must have' collection.

ENEMY AT THE GATES

www.enemyatthegatesmovie.com/

While Enemy at the Gates has garnered mixed reviews from fans of military history, the sets and filming are superb (they should be, at $85 million this is the most expensive movie yet produced in Europe). It's curious that Hollywood has suddenly discovered the Eastern Front, just as 1C:Maddox Games are about to release the first simulation ever based on this neglected arena of study. Perhaps the end of the Cold War will result in more films that redress this imbalance, and in turn spawn greater interest in personalities and events almost unknown to the west.

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The RAF in World War II

RAF B-26 Marauders on patrol over Iraq

The big screen for the boys in blue

There seems to be an ever increasing number of documentaries about at the moment that seek to chronicle the events of World War II and most of them use the same stock footage (often Ministry of Information film) to illustrate their subject. The RAF in World War II is a recent release from Classic Pictures and while you may have seen some of this film before, there's more than enough new footage to inform and entertain even the most well-versed student of aerial combat.

This 90 minute (maily) B+W video is a compilation from a three-volume video collection of the same name. It is narrated by Edward Woodward and occasionally you can see some odd cuts as the editors have sought to pare down the original collection. However, this does not detract from the overall product and the role of the RAF in the last war is chronicled in great detail, starting with the state of the air force at the outbreak of war.

An RAF Blenheim V (Bisley) attacking Italian shipping in the Mediterranean

The video is divided up into 'chapters' and initially follows a familiar pattern as it covers the Battle of France, The Battle of Britain and the bomber offensive. However, unlike many similar documentaries, it also outlines the role played by light bombers (including Battles and Blenheims) during the costly daylight raids before 1942. The Wellington also gets a fair amount of coverage and there is also a large section on the RAF's role in the Middle East (again with much Blenheim footage). The Far East theatre is also mentioned. Coastal Command is not forgotten and the narrator explains their important contribution to containing the effects of U-Boats, as well as charting the development of anti-submarine combat. The importance of a skilled ground crew to the RAF's success is also mentioned and the makers are to be congratulated for including areas of the service that are often ignored in similar videos.

Some bits of the film may be familiar (lots of clips from Target for Tonight in the Wellington section), but this is a good value package and still manages to offer a fresh perspective. If you have trouble finding it in the shops, it's available at www.amazon.co.uk ■

Derek Smalls

REVIEW SCORE:			
Publisher: Classic Pictures Entertainment		**Price:**	£12.99
Website:	N/A	**Release Date:**	Out now

At a glance: You may have seen some of the footage before, but it's well worth the money for the stuff you haven't. Good commentary as well.

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Downloads

Star performers from the Internet

Once again we've had the difficult task of choosing our recommendations form the plethora of superb quality new freeware that's available on the Internet. As usual, there were more Flight Simulator 2000 files uploaded this month, than for any other sim. To encourage a bit of healthy competition, we've decided to suggest a 'Star Download' with each issue that will focus on files we think are of really outstanding quality.

BOEING 747-400 Singapore Airlines — Flight Simulator 2000 Aircraft

The aircraft we've chosen as our first Star Download is by the Project OpenSky group, who have featured before in this section. Their rendition of a Singapore Airlines 747-400 with a special paint job surpasses the quality of some commercial products and is well worth the 5Mb download. It has a 48-sided variable geometry fuselage, fully operational control surfaces, rotating fan blades, tilting undercarriage bogies, transparent windshield and 3D pilots.

Authors: Mitsushi Yutaka , Hiroshi Igami. (Project OpenSky)
flight dynamics by Johan C Dees and painted by Yosuke Ube

Download From: www.avsim.com
Filename: os744sqt.zip

RAF B-17F Flying Fortress — Flight Simulator 2000 Aircraft

This is a complete aircraft, panel and sound file set of a Boeing B-17F Flying Fortress, repainted in RAF Mk.IIAA livery. The panel and sound pack feature individual engine startup/shutdown, full night lighting, and readable instrumentation.

Authors: Repaint by Walter Myers (original - Herve Devred, gauges - Chuck Dome, panel, sound and dynamics – Jorgen Unschuld)

Download From: www.avsim.com
Filename: jub17raf.zip

Sikorsky UH-60 BlackHawk — Flight Simulator 2000 Aircraft

A complete aircraft and panel file set for the formidable Sikorsky UIH-60 BlackHawk Helicopter. The author has gone to some trouble to get the fuselage shape right, together with one of the best rotor animations we've seen. The panel is equally impressive with custom gauges, virtual cockpit view and accurate flight model.

Author: Dwight Booth

Download From: www.avsim.com
Filename: blackhawk.zip

Cessna C-177 Cardinal — Flight Simulator 2000 Aircraft

The Cessna 177 has trained many private pilots and its sleek airframe and 180hp Lycoming engine making it fairly fast and the perfect plane for cross-country flying. The retractable gear version is designed the 177 RG. This FSDS design includes full moving parts, virtual cockpit, transparent canopy with glass reflections and an instrument panel with 360-degree cockpit bitmaps.

Author: Mikko Maliniemi

Download From: www.avsim.com
Filename: c177card.zip

McDonnel-Douglas DC 10 — Flight Simulator 2000 Panel

This is a very comprehensive panel depicting the MD-DC 10. Taken from an original FS98 version it has been updated to work with Flight Simulator 2000 and includes reworked and more realistic bitmaps, new gauges and the standard FS GPS. If you prefer the ACS-GPS it will work with that too.

Author: Dale Britton

Download From: www.flightsim.com
Filename: dc10v1db.zip

Kai Tak Airport — Flight Simulator 2000 Scenery

Here's an amazing rendition of Hong Kong's Kai Tak airport, complete with hundreds of buildings, detailed airport facilities including the Cargo Terminal at Kwai Chung. This shows how far you con go to create a realistic airport given the time and patience.

Author: Thomas Kwong

Download From: www.flightsim.com
Filename: kt2000v3.zip

Barcelona Venezuela — Flight Simulator 2000 Scenery

When we originally downloaded this file we assumed it was Barcelona in Spain. However, don't be deceived - it's the one in Venezuela. The airport has been built with minute attention to detail, complete with photo realistic buildings, static aircraft, utility vehicles, custom trees and fencing.

Author: Sabino Yacobone

Download From: www.flightsim.com
Filename: barcelona.zip

Birmingham International Airport — Flight Simulator 2000 Scenery

Another brilliant rendition from John Walker. His versions of East Midlands and Cardiff are two other 'must have' files for UK pilots. The variation in custom textures for the buildings and static vehicles make this a very realistic airport to visit. As you can see from the screen shot the perimeter fencing and beautifully designed foliage make taxiing a pleasure in itself.

Author: John Walker

Download From: www.flightsim.com
Filename: bham2kv2.zip

FS Fault — Flight Simulator 2000 Utility

This utility is something novel because it allows you to simulate the failure of anything from a single switch to a whole aircraft system. The idea is to make you less complacent simply because you're flying a simulator. The program is controlled from a screen where you use sliders to set the level of reliability. You need Peter Dowson's FSUIPC.DLL version 2.2 or higher installed to realise the full potential. (This is on our CD).

Author: Ray Sotkiewicz

Download From: www.avsim.com
Filename: fs-fault 1.03.1.zip

Aero L39 Albatros — Flight Simulator 98 Aircraft

The Aero L39 Albatros is a Czech two-seat jet trainer used for basic and advanced pilot training. This FS98 version features animated moving parts, ailerons, elevator, rudder, flaps, air brakes and gears. The 3D model has working lights, a new 3D virtual cockpit and transparent canopy.

Author: Milan Lisner

Download From: www.flightsim.com
Filename: l39ba981.zip

Piper Arrow VH-EHK — Flight Simulator 98 Aircraft

This is another favourite of the GA pilot, the Piper Arrow. Depicted here as VH-EHK a repaint of an original Captain Slug aircraft by Chris Watt, the real aircraft is based at Jandakot Airport in Perth, Western Australia. The model boasts animated gear, flaps and see-through cockpit.

Author: Chris Watt

Download From: www.flightsim.com
Filename: ehkra28.zip

Student Pilots Manual — Flight Simulator 98 & 2000 Utility

In this IFR lesson you have to fly a non-precision NDB approach in a C182 at one of the world's busiest general aviation airports, Bankstown NSW, Australia. Designed for the advanced pilot to test his skills under the glare of an instructor. It is a complete package with maps, approach plates, the adventure code and ATC with Rick Carroll, a real controller.

Author: Ray Porteous

Download From: www.flightsim.com
Filename: stupilot.zip

Lockheed Lightning P-38J — Combat Flight Simulator 2 Aircraft

This aircraft is a fully functional freeware demo model that will eventually become part of a forthcoming commercial release by Blue Arrow. It features working 3D gauges, steerable landing gear, full moving parts, correct flap motion and nighttime textures. The visual model is optimised to give a high frame rate and includes a true CFS2 .air file. The sounds are from a real P-38 Lightning, including realistic Doppler effects.

Authors: Roger Dial, Bruce Thorson, Mike Hambly

Download From: www.flightsim.com
Filename: BA P-38J Lightning.zip

Lockheed Martin P-3B V1 — X-Plane Aircraft

The P-3C Orion is the premier land based anti-submarine warfare platform. The latest update IIIR version also provides substantial anti-shipping and land attack capabilities. The Orion was loosely based on the Lockheed L-188 Electra airliner. The author has done a very fair job of recreating the Orion, given the constraints imposed by the X- Plane Planemaker.

Author: Chris Buff

Download From: www.flightsim.com
Filename: p3b.zip

Iberia Boeing 767-300 — X-Plane Aircraft

There are some very nice aircraft available for X-Plane, in fact most of the heavy mob are catered for. This Iberian 767-300 is a repainted and modified design from an original by Paolo Grifantini. It comes with an excellent flight model and photo realistic panel shown here at night with full illumination.

Author: Manuel Urrutia Avisrror

Download From: www.avsim.com
Filename: xpib7673.zip

Learjet 35A — Fly! Aircraft

Elsewhere in this issue we've got a feature on Rob Young, who is doing his bit to add accuracy to the flight models of aircraft from Fly! and Flight Simulator. This latest offering, a Learjet 35A for Fly!, is accurate enough to convince any budding millionaire pilot that it's the real thing!

Authors: 3D model - Andrew Farnaby,
flight model - Rob Young, test pilot - Peter Sidoli

Download From: http://website.lineone.net/~r.young/fly!
Filename: learjet35a.zip

Product Listings

Our comprehensive round up showing our favourites from the many products we've evaluated over the months. Please note that the prices indicated are the RRP where available, but remember the dreaded VAT. Be sure to check for bargains at your favourite sim emporium as there are often savings to be made!

CIVIL SIMS

Elite 6.0

Undoubtedly the best IFR procedural trainer there is. So it should be, the frightening price will put off all but the truly serious - the full kit can cost £695 or more with the new scenery add-on.

Initiative Computing £249.95 — **www.flyelite.com**
Featured: Issue 4

Flight Simulator 2000

Despite much publicised criticism over poor frame rates and misleading PC requirements, this still seems to be the benchmark sim. An awful lot of sim for the money, but invest in a decent PC before buying.

Microsoft £49.99/£69.99 — **www.microsoft.com**
Featured: Issue 2

X-Plane

Not for beginners or casual flyers, but definitely the 'thinking man's flight sim' - it's even compatible with a Mac, you can fly on Mars (among other places) and we loved the flight model. It also gets regular updates so Internet access is a must.

Laminar Research £various — **www.x-plane.com**
Featured: Issue 6

Precision Simulator 744

A no compromise and no-frills approach to flying a Jumbo Jet. No pretty scenery or advanced terrain but probably as close as you'll ever get to the real thing without a trip to a full motion airline simulator

Aerowinx £189.99 — **www.aerowinx.com**
Featured: Issue 6

Airline Simulator 2

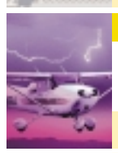
Some of the best airline flight modelling around with accurate procedures (its been designed by real airline pilots over many years). Unfortunately not for the faint of heart - old DOS interface and daunting controls a real put-off. A lot cheaper these days, so maybe worth a look.

Just Flight £49.99 — **www.justflight.com**
Featured: Issue 1

Airport Inc.

Take a rest from flying and show BAA how they should really run Heathrow. Fun, yet ultimately limited airport management game. Worth a look if that's your bag.

Take 2 £29.99 — **www.take2games.com**
Featured: Issue 4



FlitePro

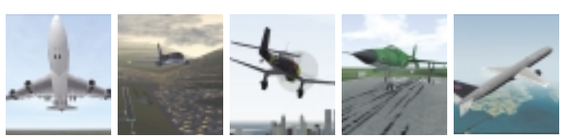
Offers a wide range of training features for the IFR pilot, yet reasonably affordable. Low frame rate for instruments detracts from its overall appeal.

Jeppesen £99.99 — **www.flitepro.com**
Featured: Issue 4

Fly!

Overshadowed by Microsoft's mighty sim, Fly! has gathered a loyal following. Thought to be better than its rival and some excellent add-ons (and patches) enhance the appeal from when we originally rated it. Available at less than £10 in some stores so a true bargain!

Take 2 £39.99 — **www.iflytri.com**
Featured: Issue 1

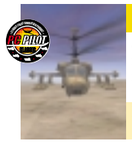


COMBAT

Combat Flight Simulator 2

Quite simply the best all round WWII flight simulator there is. However, make sure you've got a decent PC to take full advantage of the looks and feel.

Microsoft £29.99 — **www.microsoft.com**
Featured: Issue 8



Enemy Engaged: Comanche vs. Hokum

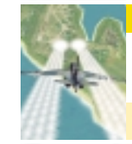
Strikes the balance between gameplay and realism perfectly. Ideal for both rocket junkies or rotorcraft rookies alike. Only downside is no single mission mode and it's not as pretty as Gunship.

Empire £29.99 — **www.enemyengaged.com**
Featured: Issue 5

Tuskegee Fighters

Beautifully designed aircraft and excellent scenery. The great missions add the final touch of genius. One for any CFS fan's must-buy list!

Abacus £29.99 — **www.abacuspub.com**
Requirements: CFS — **Featured:** Issue 5



Flanker 2.0

Excellent, with great detail. This is one of the few combat packages that is worth calling a simulation. Online fan base will prolong longevity and now there's an update as well.

Mindscape £34.99 — **www.ssionline.com**
Featured: Issue 2

Janes F/A 18

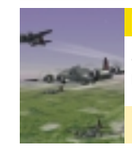
Technically complex with masses of detail and lots of options. Mission builder is nice. Downside is that it is technically complex and you need a high-spec PC.

Electronic Arts £39.99 — **www.janes.ea.com**
Featured: Issue 5

Battle of Britain

Superb flight modelling and the best dynamic campaigns ever are what hardcore dogfighters have been waiting for. Tough on beginners but worth persevering.

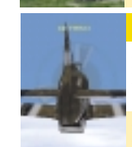
Empire £24.99 — **www.empireinteractive.com**
Featured: Issue 9



B17-II The Mighty Eighth

Excellent sound, motion animation, outstanding graphics and T&L support, it looks good and flies even better. The ultimate bomber sim, but demanding on hardware and no FF support.

Hasbro £29.99 — **www.b17flyingfortress.com**
Featured: Issue 9



Fighter Ace II

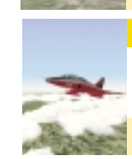
If you've got a fast Internet link and you fancy some live (for the moment) opposition, then this is as good an introduction as any to combat on the web. Excellent graphics and a reasonable cost.

Microsoft £6.50 per month — **www.zone.com/fighterace**
Requirements: Internet link/modem — **Featured:** Issue 7

Air Power - The Cold War

Nato vs The Warsaw Pact - relive the days when "njet!" meant "get in the bunker, the reds are coming!" Now with CFS missions and campaigns this has evolved into an excellent add-on.

Just Flight £24.99 — **www.justflight.com**
Requirements: FS98/2000 or CFS — **Featured:** Issue 7



Royal Air Force 2000

Ecletic, yet balanced, mix of aircraft with excellent panels and bonus of missions for CFS users. A few clumsy details on some of the aircraft are the only downers. Now free with PC Pilot!

Just Flight £24.99 — **www.justflight.com**
Requirements: FS98/2000 or CFS — **Featured:** Issue 4

SCENERY AND AIRCRAFT

FS Traffic

Perhaps the best £20 you can spend enhancing Flight Simulator - it really does bring airports to life. Now in boxed and download flavours.

Just Flight £19.99 — **www.justflight.com**
Requirements: FS98/2000 — **Featured:** Issue 2

747-400 Professional

Quite simply the best Jumbo add-on for FS2000 we've seen and if you like this you'll also like the 777-200 from the same stable. Read the manual and you'll probably be able to fly the real thing!

Just Flight £34.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 9

767 Pilot in Command

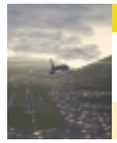
A new level of excellence for this jet airliner for FS2000. Worth every penny for the abundance of features.

Just Flight £24.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 10

Airport 2000 Volume 2

Incredibly detailed renditions of major airports with decent aircraft and adventures. Sadly a frame-rate hog in both FS98 and 2000 and adventures are complex.

Just Flight £29.99 — **www.justflight.com**
Requirements: FS98/2000 — **Featured:** Issue 4



FS Clouds 2000

Fantastic effects with a minimal frame-rate hit and apart from a few graphic glitches it is a worthwhile improvement on Microsoft's own fluffy stuff.

Just Flight £24.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 6

German Airports 3

Wonderful enhancement for those interested in flying to the Fatherland. Like all beautiful things though, can drain system resources alarmingly.

Aerosoft £24.99 — **www.aerosoft.com**
Requirements: FS98/2000 — **Featured:** Issue 4

Mad Dog 2000

Now updated and running in FS2000, a very competent add-on that makes FS2000 feel like a different simulator. Not cheap, but it's much more than just one aircraft.

Lago £34.99 — **www.lagoonline.com**
Requirements: FS98/2000 — **Featured:** Issue 7

Real Airports

Some very well executed versions of international airports. With an excellent manual and some adventures this is a good value package

Just Flight £29.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 10

737 for Fly!

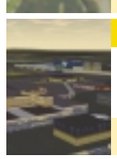
A meticulous re-creation of the 737-500 for Fly! Superb detailing is only let down by blurry external textures. Not many commercial add-ons for Fly!, so worth having!

Wilco £18.95 — **www.wilcopub.com**
Requirements: Fly! or Fly!2K — **Featured:** Issue 6

Rhein-Ruhr for Fly!

An excellent addition to Fly! for Europeans - could do with a few more buildings, but all the landmarks are there.

Aerosoft £25.99 — **www.aerosoft.com**
Requirements: Fly! & Fly!2K — **Featured:** Issue 10



English Airports

A vast improvement on the default scenery and while it isn't as instantly impressive as some scenery, it actually works in FS2000 without needing a new PC.

Just Flight £19.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 8

HARDWARE

AFCS II Yoke

Heavy metal control, hand crafted and definitely the Aston Martin of controllers. Eye-watering price to match, so you need to be serious.

AETI £400.00 — **www.simpilot.com**
Featured: Issue 3

GeForce 2 GTS

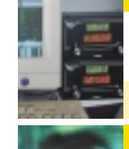
Fantastic performance, a powerful feature set and frequent driver revisions to keep it fresh - probably the current champion (until the next one!)

nVIDIA £205.00 — **www.nvidia.com**
Featured: Issue 8

Sirocco Crossfires

Probably the best speakers for your PC before it becomes your hi-fi. Not recommended for small flats!

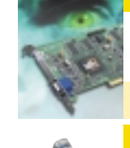
Videologic £235.00 — **www.videologic.com**
Featured: Issue 6



Go Flight GF45

A very useful item - no fuss USB unit that takes the place of on-screen avionics display and keyboard controls - buy five for a full radio stack!

Go Flight £79.95 — **www.goflightinc.com**
Featured: Issue 7



Voodoo 5 5500

The last offering from 3dfx, complete with FSAA. Better frame rates and smoother lines, but now 3dfx are defunct they may be hard to find and with varied support.

3dfx £249.00 — **www.3dfx.com**
Featured: Issue 6

Logitech Wingman Strike Force 3D

Powerful and smooth force feedback with extensive programmability makes this a wise choice. Shop around as prices vary wildly.

Logitech £89.95 — **www.logitech.com**
Featured: Issue 9

OTHER PROGRAMS

SimCharts

Genuine Jeppesen airport charts (to all intents and purposes) at a bargain price. But they're on the CD and you need a decent printer. Treat yourself to the expensive pack and get printed en-route charts too.

Jeppesen £19.99/£29.99 — **www.jeppesenpcpilot.com**
Featured: Issue 2

ProFlight 2000

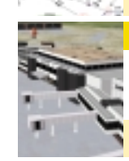
One of the best ATC/adventure generators around, with enough customisation potential for everyone. Plan adventures with real voice ATC - even with amusing 'local' accents.

Just Flight £34.99 — **www.justflight.com**
Requirements: FS2000 — **Featured:** Issue 8

Final Approach

Good value package that not only solves the mystery of IFR approaches, but also provides fistfulls of airport plates too. Not for the casual flyer though.

Just Flight £24.99 — **www.justflight.com**
Featured: Issue 5



FS Design Studio Pro

A great package for designing scenery and aircraft. While relatively easy to use it can be tricky to place scenery accurately. Used by many developers, which proves its worth.

Abacus £24.99/£44.99 — **www.abacuspub.com**
Requirements: FS2000 — **Featured:** Issue 5

Ultimate Airlines

A comprehensive list of worldwide flights - a must have for VA pilots or anyone wanting to recreate airline operations.

Flight One £24.99 — **www.flight1.com**
Requirements: FS2000 — **Featured:** Issue 9

THE *ONLY* HUB FOR VIRTUAL AIRLINES

Hallelujah! It's raining (Dutch)men

While we were at the DFSO Flight Sim Show we were impressed to see so many Dutch virtual airlines represented. Our closest neighbours on a nearby stand were the very friendly chaps from the Air Umbrella VA Group. They're keen to point out that Air Umbrella has nothing to do with rain and they told us: "our goal is to make Air Umbrella as real as possible, but it has to stay fun for everybody since we are all people behind a computer and not in a real plane." This sounded like a great philosophy to us and we asked for some more information.

As well as a stand at the DFSO event, they had some very professional looking brochures and Rob, Steve and Arjen were happy to answer our questions. Air Umbrella was formed in 1998 and began modestly with a hub at Maastricht-Aachen airport and then added Liege-Bierset (in Belgium). These two airports are close enough to be linked by a shuttle-bus so they added another hub at Groningen-Eelde and future plans include moving passenger operations from Liege to Cologne, whilst keeping Liege as a base for cargo.

One thing that really impressed us about Air Umbrella was their 'friendly' training division. In contrast to some other VAs where a checkride is used to check a pilot's skill (which can be quite daunting), the checkride at AUVA is designed to provide the pilot with some positive feedback. It's flown at the pilot's request (so, only when you feel ready) and after the flight, the airline produces a report that outlines good and bad points about the flight and gives advice on where flying skills can be improved.

So, what are you waiting for? Come in out of the rain and get under this Dutch umbrella!

Derek Smalls

CONTACT DETAILS
CEOs - Rob Bindels and Steve Gryskiewicz
ceo.auva@bigfoot.com
Website: www.airumbrella.com and
www.flightsimmers.net/airport/airumbrella

MORE VAs AROUND THE GLOBE

60th HELICOPTER SUPPORT UNIT
A military style outfit that flies choppers in combat roles.
WEB: www.geocities.com/60thvaw/60thhsu/index.html

AFRICAN EXPRESS (AFEX)
This is a South African VA operating a network of schedules both within and out of Africa.
WEB: www.afex.co.za

AFRICAN INTERNATIONAL AIRLINES
Heralded as Africa's premier virtual airline, they offer flights throughout the continent.
WEB: www.evalunet.com/aia/

AIR JET UK
AirJet offers a gateway to virtual airline flying, with a training academy and a young pilots club.
WEB: www.flightsimnetwork.com/airjet/

AIR LINGUS
This airline is based on the real Aer Lingus. A must for Irish pilots.
WEB: http://aer-avensis.hypermart.net/main.htm

AIRKENT UK
AirKent is a London based VA with their main hub at Gatwick South Terminal.
WEB: www.airkentuk.co.uk/

Airsource Virtual Employer located at www.ar-source.com We're a fairly new VA with a different concept.

ALASKA VIRTUAL AIRLINES
Alaska and Horizon boast one of the most realistic flight schedules found on the Internet.
WEB: http://alaska_va.tripod.com/

ATLANTIC AEROSPACE CORPORATION
Includes Atlantic Skies (circa 1996), Golden Airlines, Atlantic Charters and New England Express.
WEB: www.atlanticskies.com

BAHAMASAIR VA
Worldwide destinations as well as the United States, Bahamas and surrounding islands.
WEB: http://cybermoo.net/bahamasair

BRITANNIA VIRTUAL AIRLINES
Like the real Britannia, with hubs at Manchester and Gatwick and flights to the same destinations.
WEB: www.BritanniaVA.co.uk

BRITISH AIRWAYS VIRTUAL
Started life in April 2000 and their aim is to make flying with them rewarding and enjoyable.
WEB: www.bavirtual.co.uk

BROOKS AIR VA
One of the growing band of VA's that are rewarding the skills of their pilots with giveaways.
WEB: www.brooksair.co.uk

CALIFORNIA AIR
An X-Plane VA offering worldwide airline, charter and cargo services, with no experience needed.
WEB: www.californiaAir.net

CARGO VA
Another VA that has an award scheme for its pilots and hands out software prizes.
WEB: www.cargova.com

DC3 AIRWAYS
This is a novel Virtual Airline that introduces virtual pilots to the DC3.
WEB: www.dc3airways.com

EASTERN VIRTUAL AIRLINES
With over 300 pilots in their ranks, plus real 757 and 767 pilots available to answer questions.
WEB: www.evair.com/index.htm

EASY JET VIRTUAL AIRLINE
A VA that's approved by the easyJet Airline Company Ltd., they fly from the same four hubs.
WEB: www.easyjetvirtual.co.uk

EUROPAIR VIRTUAL AIRLINES
A realistic virtual airline aimed at pilots who might be interested in flying for a real airline.
WEB: www.europairva.net

EUROPEAN WORLD AIRWAYS
Hubs based at Heathrow and JFK, they serve Europe, the middle east and America.
WEB: http://ewa.ibusinessdot.com

EUROSTAR AVIATION
Described as an award-winning virtual airline with an emphasis on detail and professionalism.
WEB: www.esava.net

HAWAIIAN AIRLINES VA
A slightly different VA for PCs and Macs, but only using PS1 or X-Plane. Book him, Danno!
WEB: www.gorji.com/hawaii.html

ICELAND AIR
They fly to most of the major airports on the US East Coast, Canada, and Europe.
WEB: www.allineed.is/icelandairva

JERSEY GROUP OF AIRLINES
A VA group that includes Jersey Euro Link, Jersey Cargo Link and Jersey Sun.
WEB: www.jersey-va.co.uk

JMC VIRTUAL AIRLINES
JMC has many pilots and an in-house aircraft designer. They operate out of Newcastle, UK.
WEB: www.virtualjmc.homestead.com/main.html

KNIGHT AIR
This VA has three hubs in the UK and an extensive worldwide route network.
WEB: www.knightair.org

MANCHESTER AIRWAYS VA
Manchester Airways has an extensive UK network operating out of Ringway (Manchester).
WEB: http://manchester.atcworldstar.com

MAVERIC VA
Combining a sucessful world-wide clandestine operations service with a commercial airline
WEB: www.mavericva.co.uk

NEW YORK CENTRAL & ADIRONDACK VA
Something for everyone - NYC covers the east coast and Adirondack handles shorter routes.
WEB: www.flightsimmers.net/airport/nva/

NOBLE AIR
Noble Air has hubs around the world and they're very proud of their ability to retain pilots.
WEB: www.nobleair.com

OXAIR VIRTUAL AIRLINES
Based in Oxford in the UK OxAir is one of Europe's premier regional VAs.
WEB: www.oxair.homestead.com

PACIFIC BREEZE VA
This VA has been unning for a long time with over 50 pilots and facilities for world wide travel.
WEB: www.pacbreezeva.com

PACIFIC WEST AIRWAYS
A US-based VA, Pacific West pilots can choose from seven operating hubs around the world.
WEB: www.pacificwestairways.com

PARADISE WORLD AVIATION
They have a Pilots Reward Program and their crews are able to get free software and other gifts.
WEB: www.pwaviation.com

POLAR AIRWAYS VIRTUAL AIRLINE
Their hub isbased at Amsterdam Schiphol Airport (EHAM) and offices are at Almere in Holland.
WEB: www.polarairways.com/

SOLENT AIRLINES
Operating from Southampton, Bournemouth, Southend, London City, Gatwick and Birmingham.
WEB: www.solentairlines.btinternet.co.uk

SOUTHWEST VIRTUAL
This airline claims an impressive 1,000,000 hits per month on its website.
WEB: http://www.virtualswa.com

TEXAS AIR CARGO
This VA operates out of Austin/Bergstrom International Airport in the Lone Star state.
WEB: www.geocities.com/texas_air_cargo/

TRANSVIRTUAL AIRLINES
They have hubs at Frankfurt, Indianapolis and JFK as well as a training facility at Honolulu.
WEB: hwww.transvirtualairlines.com

VIRGIN SUN
Based at Birmingham and London-Gatwick to and from sunspots around the globe.
WEB: www.members.aol.com/Afre63456/vvs/

VIRTUAL 2000
Europe's favourite leisure VA, operating to over 90 destinations from the UK.
WEB: www.virtualair2000.co.uk

VIRTUAL BRITISH CALEDONIAN AIRWAYS
VBCA is a virtual airline that is targeted towards UK and European flight simmers.
WEB: www.avsim.com/hangar/air/vbca/index.html

VIRTUAL DELTA AIRLINES
Aimed at the aviation enthusiast interested in airline operations, especially Delta airlines.
WEB: http://virtualdelta.cjb.net/

WEST EUROPEAN AIRLINES
Operates out of Gatwick,Orly and Cologne, with an innovative \ routing system
WEB: www.weva.homestead.com/main.html

WESTWIND VA
This VA boasts some pretty challenging schedules, with over 3,000 pilots in its ranks.
WEB: www.flywestwind.com

WINGS INTERNATIONAL ALLIANCE
This group is a collection of airlines from around the globe that fly just about anywhere.
WEB: http://members.xoom.com/wingsint

If you have a virtual airline that is not listed here, the please feel free to send in a short description to mail@pcpilot.net where we will endeavour to include it in a future issue. Also, if you want to earn revenue and prizes for your VA, why not join our affiliates scheme? For more details drop us a mail.

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